CHAPTER I.

HISTORICAL SKETCH OF

EXPLORATIONS AND SURVEYS

IN MINNESOTA.

By N. H. WINCHELL.

The geographical position of Minnesota is such that for the last two hundred years it has been the *ultima thule* for western travelers and adventurers. Before railroads and highways had made it possible to reach the state from the Atlantic cities easily and quickly, it was the turning-back point for most explorers, traders and adventurers. The route by the great lakes terminated at Fond du Lac, the head of the great system of inland lakes of North America. The route by the Mississippi for canoes either ceased at the Falls of St. Anthony, or, if pushed further, was lost in a labyrinth of small streams and lakes in which the Mississippi has its origin. Westward from the Mississippi, or at least westward from the Red river of the North, and the St. Peter's, extended the boundless prairies of the continent, to cross which, or to enter on which, was, to most travelers, too arduous and too fruitless an enterprise; and few were hardy enough to penetrate so far as the "Shining Mountains," which constituted the next natural goal of the explorer's ambition. Not only the zeal of the missionary, but the cupidity of the fur-trader—*avant coureurs* of American civilization—found in Minnesota a long halting-place. Hence a multitude of published "journals" and "expeditions," or "visits," have made Minnesota widely known throughout both English and French-speaking countries. Many ot these volumes are ignored in the following historical synopsis.

The design has been to note the steps of geographical, as well as geological exploration as authenticated by governmental or semi-official publications.

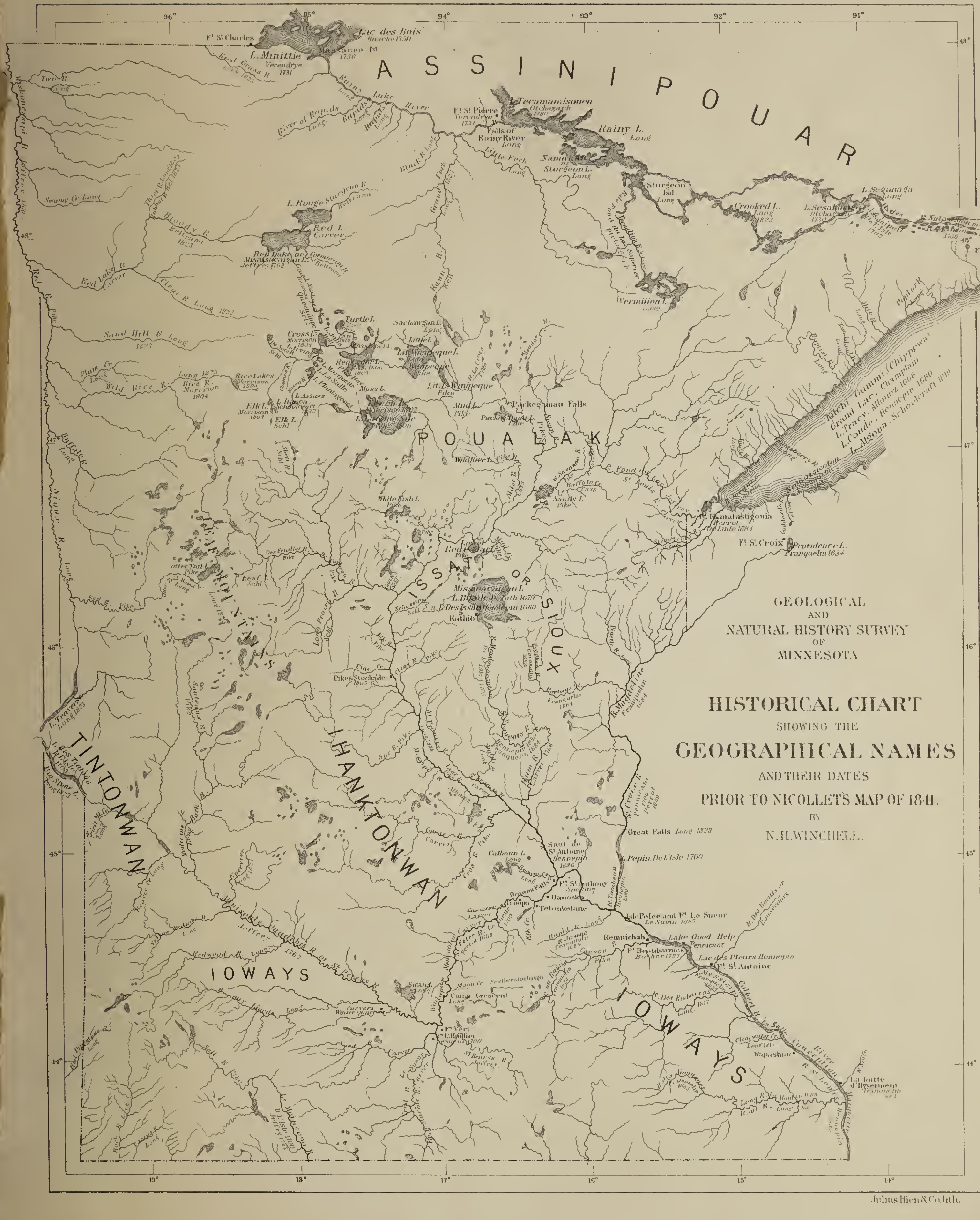
At the conclusion of peace between Great Britain and France, in 1763, the territory which is now embraced within Minnesota was divided by a line running south from the international boundary to the source of the Mississippi river, and thence southward along the Mississippi. France retained that portion lying to the west of the line, and that to the east was declared subject to the British crown. The name *Louisiane*, which was applied by the French to the lower portions of the Mississippi, was extended northward so as to include all their possessions south of the forty-ninth parallel. That portion of the state which lies east of the division line of 1763 became, in 1783, a part of the original area of the United States, included in the "Territory northwest of the Ohio river." In 1803 France ceded the "province of Louisiana" to the United States. Minnesota was admitted into the Union, as a State, in the year 1858. The history of exploration may hence be divided into three parts: 1. Period prior to 1783; 2. Period of Territorial Exploration; 3. Period of State Exploration and Survey.

I. PERIOD PRIOR TO 1783.

The map of Champlain shows the knowledge he obtained of the western country from the Hurons at the time of his visit to their country in 1615.* This represents the "Grand Lac," which is the French for Kitchi Gummi, the Chippewa name of lake Superior, with a large stream entering it from the south, called "La Grande Rivière." This probably refers to the Mississippi, of which he could have had only a vague idea, and especially since no such stream, commensurate with the importance which he has given this, enters lake Superior from the south. The accident of its being

*The principal authorities consulted on the earliest geographical explorations in Minnesota are the following *Notes pour servir a l'histoire et a la bibliographie et la cartographie de la Nouvelle-France et des Pays adjacents*, 1545–1700; par l'auteur de la Bibliotheca Americana vetustissima, Paris, Librairie Tross, 1872. *The Collections of the Minnesota Historical Society*, four volumes, and the *Publications of the Department of American History*, of the Minnesota Historical Society *Decouvertes et etablissements des Francais dans l'ouest et dans le sud de l'Amerique septentrionale;* by Pierre Margry, Paris Hennepin's *Louisiana*, a translation from the French of Hennepin's first, or Paris, edition of his work on the Mississippi, by John Gilmary Shea, New York, 1880. Neill's *History of Minnesota from the earliest French explorations to the present time;* third edition, 1879, Minneapolis *History of the discovery and settlement of the Valley of the Mississippi, by the great European Powers, Spain, France and Great Britain;* by John W. Monette, two volumes, New York, 1848 By the courtesy of Rev. E. D. Neill, several manuscript copies of documents in the Archives de la Marine, Paris, and tracings of unpublished old maps from the same place, have been consulted. *Journal d'un voyage fait par ordre du Roi dans l'Amerique septentrionale*, par le P. De Charlevoix, 1744, 3 tomes, Paris. *Memoire sur les Mœurs, Coutumes et Religion des Sauvages de l'Amerique septentrionale* par Nicolas Perrot, publiee pour la premiere fois, par le R. P. Tailhan. *Historical Collections of Louisiana*, 4 vols, B. F. French. *Histoire de la Louisiane*, par M. Le Page Du Pratz, 1768 *The Works and Voyages o Champlain*, published in English by the Prince Society, Boston, 1880. *The Discovery of the Great West*, Francis Parkman 1869.

PLATE 1.



Julius Bien & Co. lith.

1659, Groselliers and Radisson.]

represented as flowing north instead of south, is no uncommon error for the early geographers who have mapped the rivers of Minnesota and Manitoba; and La Salle, in 1682, applies the same name to the Mississippi. Champlain also had knowledge of the mining of copper in the upper waters of the Saguenay (or St. Lawrence), but he seems not to have had definite knowledge whether the mines were on the south shore of lake Superior or on the "floating island" (Isle Royale) near the north shore.

The *Relations* of the Jesuit missionaries, so far as published, cover the period from 1626 to 1679. The adventurous fathers more frequently mention the savage inhabitants of the country than its geographical features. The Dakotahs are mentioned by Paul le Jeune in 1640, who says they dwelt in the neighborhood of Ouinnipigon (Winnebago), and that they and the Assinipouars (Assiniboines) had been visited by Nicollet, interpreter for the Algonquin and Huron languages for the Messieurs de la Nouvelle France, in their own countries.*

The *Relation* for 1659 thus refers to the Poualak (Assiniboines). "As wood is scarce and very small with them, nature has taught them to burn coal (charbon de terre) in its place, and to cover their wigwams with skins. Some of the more industrious also make cabins of clay (or turf) much in the same way that swallows build their nests."†

GROSELLIERS AND RADISSON.

The actual exploration of the state proceeded westward from lake Superior. In the year 1659 two Frenchmen, in the interest of commerce, made the next recorded visit to the Nadouessioux at lake Buade (Mille Lacs), where they spent the winter. Returning to France they endeavored to establish trade with the "forty Sioux villages" of that locality, but did not succeed. Groselliers, however, enlisted the English in an expedition through Hudson's bay to Fort Rupert. He seems to have reached lake Superior from Hudson's bay, perhaps by way of the Me-me-si-pi, or Pigeon river, on the international boundary, inasmuch as that river, on several ancient maps of the northwest, is styled *R. Grossillers.*

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*Neill's *Minnesota*, p. 101.

†Such habitations were occupied by the Iowas on the upper Minnesota when the Sioux first came there, and are probably the source of many of the "mounds" seen in the state of Minnesota,

MENARD.

To Marquette has been given the honor of the first discovery of the Mississippi at any point north of the Chickasaw bluff; but it appears that an earlier Jesuit missionary reached it by way of the Wisconsin river in 1661, while in pursuit of his labors, in an attempt to preach the gospel to the wandering Huron nation, twelve years before Marquette and Joliet. He descended either the St. Croix or the Wisconsin, and ascended the Black river, on the headwaters of which the Hurons had chosen a residence; but in making a portage Menard was lost in the wilderness. Marquette descended the Wisconsin and passed down the Mississippi.*

ALLOUEZ.

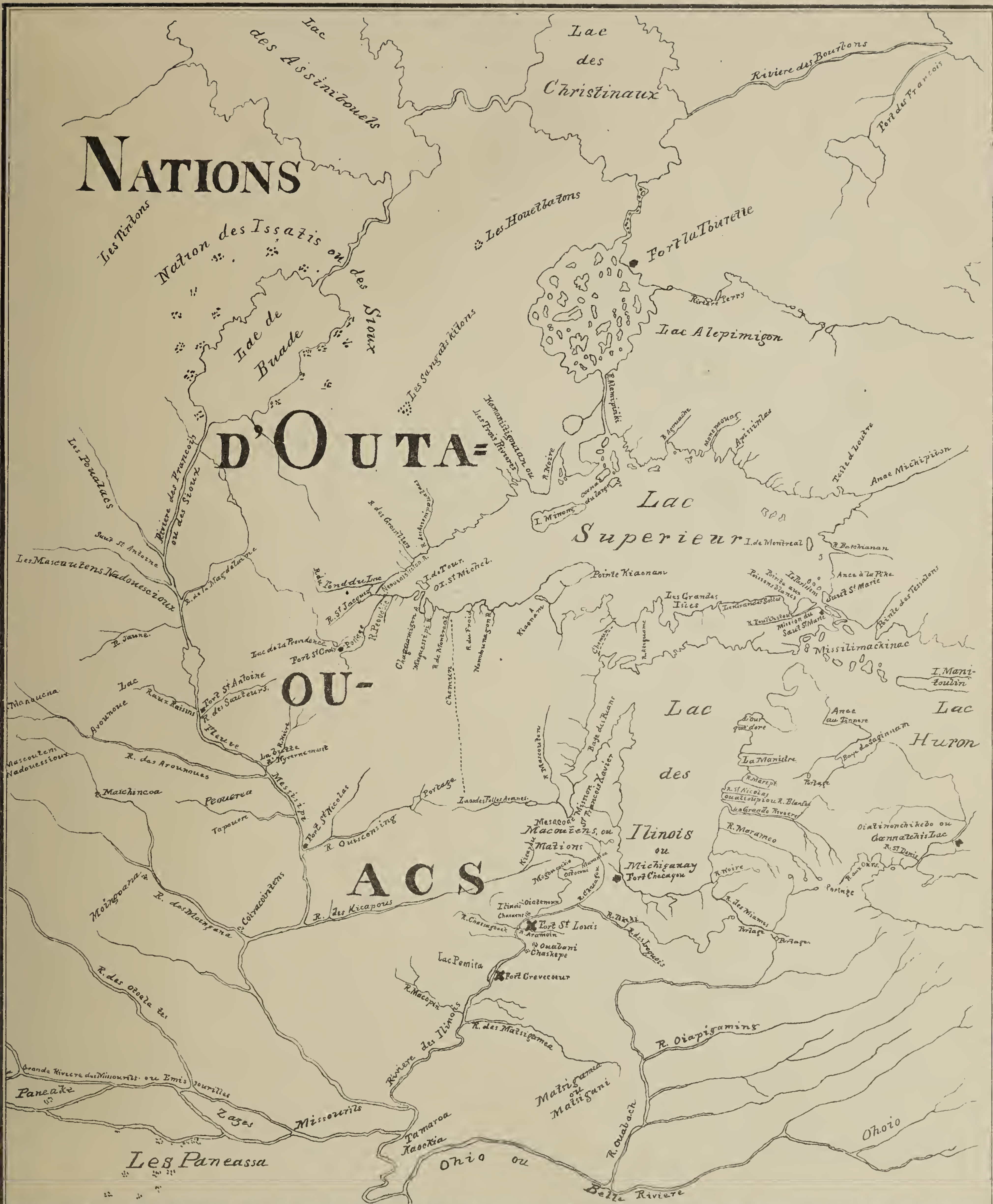
After the death of Menard, Claude Allouez was appointed, in 1665, to the Mission of the Holy Spirit, at La Pointe. It was probably in 1666 that he visited *Fond du Lac Supérieur,* and there met a number of the Nadouessioux from the country to the west and southwest, and learned for the first time of the great river, which, in his *Relation,* he denominated the *Messipi.* Allouez, however, never saw the great river of which he heard so much; on the banks of which dwelt the strange race of aborigines who were reported to live in a country of prairies abounding in all kinds of game, who cultivated tobacco and lived largely on "marsh rice," spoke a language entirely unknown, used the bow and arrow with great dexterity, and dwelt in cabins covered with deer skins—the Iroquois of the country, as Marquette styled them.†

During Marquette's administration the Mission at La Pointe was abandoned on account of the hostility of the Dakotahs, who are described by Marquette as a "certain people called *Nadouessi,* dreaded by their neighbors; and, although they only use the bow and arrow, they use it with so much skill and dexterity that, in a moment, they fill the air. In the Parthian mode, they turn their heads in flight, and discharge their arrows so rapidly that they are no less to be feared in their retreat than in their attack." Although Marquette traveled over much of the western

* Transactions of the Department of American History of the Minnesota Historical Society, E. D. Neill. In French's Historical Collections of Louisiana, Part IV., it is stated, on the authority of the Jesuit Relation of 1639-40, that Sieur Nicollet, in 1639, probably was the first Frenchman on the Mississippi after the visit of DeSoto.

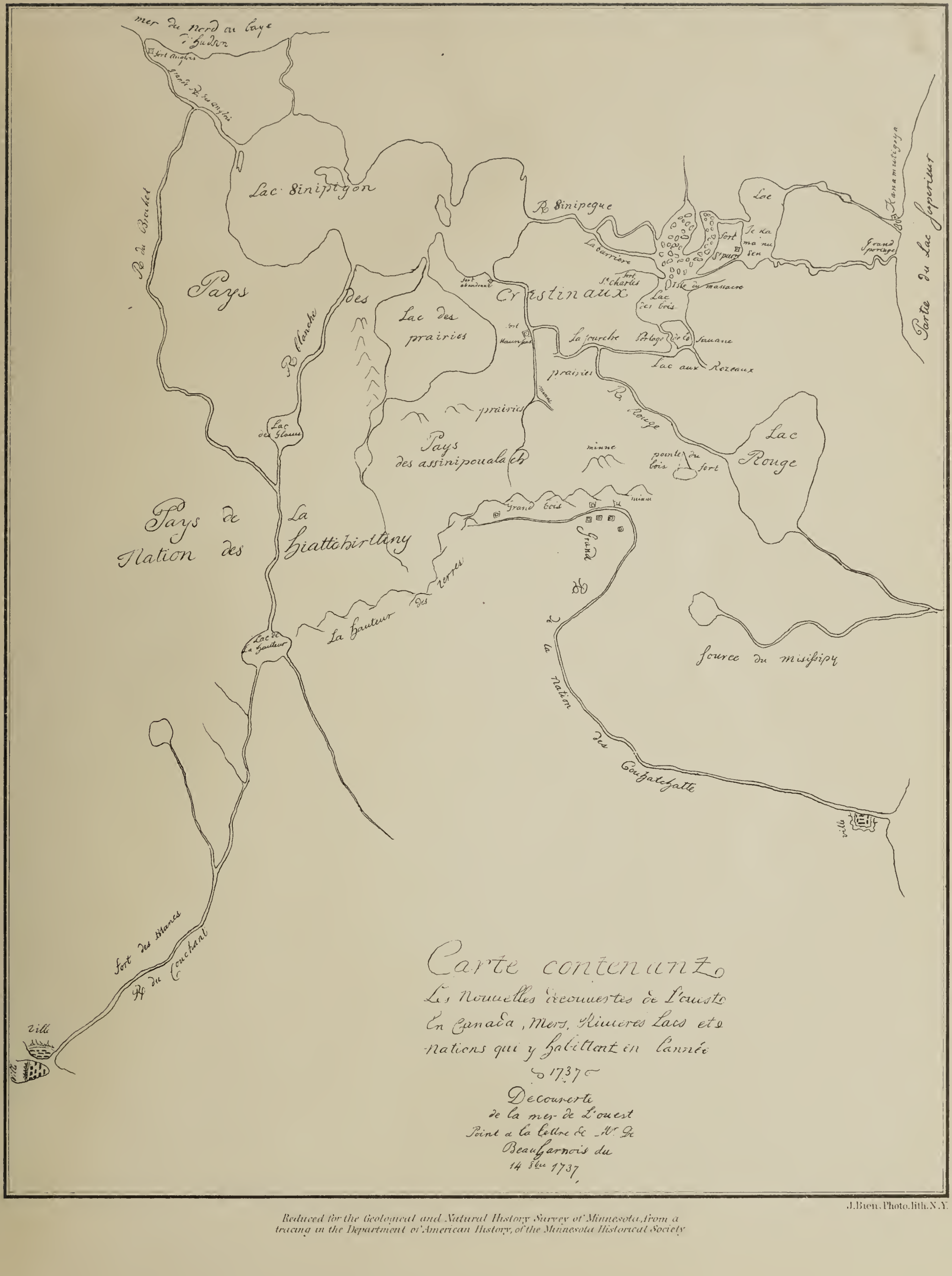
† French expresses the opinion that Allouez visited the Mississippi by way of the Fox and Wisconsin rivers in the year 1670. (Jesuit Relation of 1669-70.) *Hist Coll. Louisiana.*

PARTIE D'UNE CARTE DE L'AMERIQUE SEPTENTRIONALE, DRESSÉE PAR J. B. FRANQUELIN DANS 1688, POUR ETRE PRESENTÉE A LOUIS XIV.



Reduced for the Geological and Natural History Survey of Minnesota from a manuscript map in the Archives des Marines in the possession of the Department of American History of the Minnesota Historical Society.

J. Bien & Co. Photo. lith.



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Reduced for the Geological and Natural History Survey of Minnesota, from a tracing in the Department of American History, of the Minnesota Historical Society

1678, Du Luth.]

country south of Minnesota, visiting the Mississippi by way of the Wisconsin in 1673, he seems not to have prosecuted his discoveries within the area of Minnesota.

SIEUR DU LUTH.

Under the direction of the Governor of Canada, but probably at the instance of the merchants of Quebec, Daniel Greysolon, the Sieur du Luth, was dispatched with eight men, in 1678, for the purpose of visiting the country to the west of lake Superior, and taking possession of it in the name of the king of France, and securing the trade of the native tribes before the English could reach them. He entered Minnesota in the summer of 1679, having wintered near the falls of the St. Mary's river. In July he caused the arms of the king of France to be set up in the great Sioux village, *Kathio,* which he styles the village of the *Izatys,* which can be no other than the great Nadouessioux settlement at Mille Lacs, to which he gave the name Lac Buade. The next year he reached the Mississippi river by way of the Bois Brulé river (in Wisconsin) and the St. Croix, and encountered Hennepin and his companions, as detailed in his report made to the Marquis of Seignelay in 1685, an extract from which is as follows:*

EXTRACT FROM DU LUTH'S REPORT, MADE IN 1685.

On July 2d, 1679, I had the honor to plant his majesty's arms in the great village of the Nadoecioux, called *Izatys*, where never had a Frenchman been, no more than at the *Songaskitons* and *Honetbotons*, distant six score leagues from the former, where I also planted his majesty's arms in the same year, 1679.

On the 15th of September, having given the *Agrenipoulak*, as well as all the other northern nations, a rendezvous at the extremity of lake Superior, to induce them to make peace with the Nadouecioux, their common enemy, they were all there, and I was happy enough to gain their esteem and friendship, to unite them together, and in order that the peace might be lasting among them I thought that I could not cement it better than by inducing the nations to make reciprocal marriages with each other. This I could not effect without great expense. The following winter I made them hold meetings in the woods, which I attended, in order that they might hunt together, give banquets, and by this means contract a closer friendship.

The presents which it cost me to induce the Indians to go down to Montreal—who had been diverted by the *Openagaux* and *Abenakis*, at the instigation of the English and Dutch, who made them believe that the plague raged in the French settlements, and that it had spread as far as *Nipissingue*, where most of the *Nipissiriens* had died of it—have also entailed a greater expense.

In June, 1680, not being satisfied with having made my discovery by land, I took two canoes with an Indian, who was my interpreter, and four Frenchmen, to seek means to make it by water. With this view I entered a river which empties eight leagues from the extremity of lake Superior, on the south side, when, after having cut some trees, and broken about a hundred beaver dams, I reached the upper waters of the said river; and then I made a portage of half a

* Shea's Translation of Hennepin's Description of Louisiana.

league to reach a lake, the outlet of which fell into a very fine river which took me down into the Mississippi. Being there I learned from eight cabins of Nadouecioux whom I met, that the Reverend Father Louis Henpin, Recollect, now at the convent of St. Germain, with two other Frenchmen, had been robbed and carried off as slaves for more than three hundred leagues by the Nadouecioux themselves.

This intelligence surprised me so much that, without hesitating, I left two Frenchmen with these said eight cabins of Indians, as well as the goods which I had to make presents, and took one of the said Indians, to whom I made a present, to guide me, with my interpreter and two Frenchmen, to where the said Reverend Father Louis was, and as it was a good eighty leagues, I proceeded in canoe two days and two nights, and the next day at ten o'clock in the morning I found him with 1,000 or 1,100 souls. The want of respect which they showed to the said Reverend Father provoked me, and this I showed them, telling them that he was my brother; and I had him placed in my canoe to come with me into the villages of the said Nadouecioux, whither I took him, and in which, a week after our arrival there, I caused a council to be convened, exposing the ill treatment which they had been guilty of, both to the said Reverend Father and to the other two Frenchmen, who were with him, having robbed them and carried them off as slaves, and even taken the priestly vestments of said Reverend Father. I had two calumets which they had danced to them, returned to them, on account of the insult which they had offered them, being what they hold most in esteem among them to appease matters, telling them that I did not take calumets from people, who after they had seen me and received my peace presents, and been for a year always with Frenchmen, robbed them when they went to visit them.

Each one in the council endeavored to throw the blame from himself, but their excuses did not prevent my telling the Reverend Father Louis that he would have to come with me toward the *Outagamys*, as he did, showing him that it would be to strike a blow at the French nation in a new discovery, to suffer an insult of this nature, without manifesting resentment, although my design was to push on to the sea in a west-northwesterly course, which is that which is believed to be the *Red Sea* [Gulf of California], whence the Indians who had gone warring on that side gave salt to three Frenchmen whom I had sent exploring, and who brought me said salt, having reported to me that the Indians had told them that it was only twenty days' journey from where they were to find the great lake, of which the waters were worthless to drink.* This has made me believe that it would not be absolutely difficult to find it, if permission would be given to go there. However, I preferred to retrace my steps, manifesting to them the just indignation which I felt against them rather than to remain after the violence which they had done to the Reverend Father and the other two Frenchmen who were with him, whom I put in my canoes and brought them back to *Michelimakinak*.

HENNEPIN'S MOVEMENTS IN MINNESOTA.

That portion of Hennepin's narrative which relates to his movements in Minnesota, and to the natural features of the country, is as follows, as translated from the first, or Paris, edition of his works, by John G. Shea.

The river Colbert† runs south-southwest and comes from the north-northwest; it runs between two chains of mountains, very small here, which wind with the river, and in some places are pretty far from the banks, so that between the mountains and the river there are large prairies, where you often see herds of wild cattle browsing. In other places these eminences leave semi-circular spots covered with grass or wood. Beyond these mountains you discover vast plains, but the more we approach the northern side ascending, the earth did not appear to us so fertile nor the woods so beautiful as in the *Islinois* country.

This great river is almost everywhere a short league in width, and in some places two leagues; it is divided by a number of islands covered with trees interlaced with so many vines as

* There is no such lake in the limits of Minnesota, but this may refer to some of the alkaline lakes of Dakota [N. H. W.]

† Mississippi.

CARTE PHYSIQUE

des Terreins
Les plus elevés de la Partie Occidentale
du CANADA

Où l'on voit les Nouvelles Decouvertes
des officiers Francois à l'ouest du lac
Superieur Avec les Rivieres et les lacs
dont il Jeremie a parlé dans la rela
tion de la Baye d'Hudson.

J Bien. Photo lith. N. Y.

Reduced for the Geological and Natural History Survey of Minnesota from a tracing of a Map in the Archives des Marines, in the possession of the Department of American History, of the Minnesota Historical Society

to be almost impassable. It receives no considerable river on the western side except that of the *Otontenta*, and another, which comes from the west-northwest seven or eight leagues from the Falls of St. Anthony of Padua.

On the eastern side you meet first an inconsiderable river, and then further on another, called by the Indians *Onisconsin*, or *Misconsin*, which comes from the east and east-northeast. Sixty leagues up you leave it and make a portage of half a league, and reach the bay of the *Puans* by another river which, near its source, meanders most curiously. It is almost as broad as the river Seignelay, or *Islinois*, and empties into the river Colbert a hundred leagues above the river Seignelay.

Twenty-four leagues above you come to the Black river, called by the *Nadouessions*, or *Islati*, *Chabadeba*, or *Chabaoudeba*. It seems inconsiderable. Thirty leagues further up you find the Lake of Tears,* which we so named because the Indians who had taken us, wishing to kill us, some of them wept the whole night to induce the others to consent to our death. This lake, which is formed by the river Colbert, is seven leagues long and about four wide. There is no considerable current in the middle that we could perceive, but only at its entrance and exit. Half a league below the Lake of Tears, on the south side, is Buffalo river, full of turtles. It is so called by the Indians on account of the numbers of buffalo found there. We followed it for ten or twelve leagues; it empties with rapidity into the river Colbert, but as you ascend it it is always gentle and free from rapids. It is skirted by mountains far enough off in some places to form prairies. The mouth is wooded on both sides and is full as wide as that of the Seignelay.

Forty leagues above is a river full of rapids, by which, striking northwest, [northeast] you can proceed to lake Condé as far as *Nimissakouat*** river, which empties into that lake. This first river is called Tomb river,† because the *Issati* left there the body of one of their warriors, killed by a rattlesnake, on whom, according to their custom, I put a blanket. This act of humanity gained me much importance by the gratitude displayed by the men of the deceased's tribe in a great banquet which they gave me in their country, and to which more than a hundred Indians were invited.

Continuing to ascend this river ten or twelve leagues more, the navigation is interrupted by a cataract, which I called the Falls of St. Anthony of Padua, in gratitude for the favors done me by the Almighty through the intercession of that great saint, whom we had chosen patron and protector of all our enterprises. This cataract is forty or fifty feet high, divided in the middle of its fall by a rocky island of pyramidal form. The high mountains which skirt the river Colbert last only as far as the river *Onisconsin*, about one hundred and twenty leagues; at this place it begins to flow from the west and northwest without our having been able to learn from the Indians, who have ascended it very far, the spot where this river rises. They merely told us that twenty or thirty leagues below [above?] there is a second fall,†† at the foot of which are some villages of the prairie people called *Thinthonka*,‡ who live there a part of the year. Eight leagues above St. Anthony of Padua's Falls, on the right, you find the river of the *Issati*, or *Nadoussion*,‡‡ with a very narrow mouth, which you can ascend to the north for about seventy leagues to lake Buade,§ or of the *Issati*, where it rises. We gave this river the name of St. Francis. This last lake spreads out into great marshes, producing wild rice, like many other places down to the bay of the *Puans*.§§ This kind of grain grows in marshy places, without any one sowing it; it resembles oats, but tastes better, and the stalks are longer as well as the ear. The Indians gather it in due season. The women tie several ears of it together with whitewood bark to prevent its being all devoured by the flocks of ducks and teal found there. The Indians lay in a stock for part of the year and to eat out of the hunting season.

Lake Buade, or lake of the *Issati*, is situated about seventy leagues west of lake Condé; it is impossible to go from one to the other by land on account of the marshy and quaggy nature of the ground; you might go, though with difficulty, on the snow in snowshoes; by water there are many portages, and it is one hundred and fifty leagues, on account of the many turns to be made. From lake Condé, to go conveniently by canoe, you must pass by Tomb river, where we found only the skeleton of the Indian whom I mentioned above, the bears having eaten the flesh and pulled up the poles which the deceased's relatives had planted for a monument. One of our boatmen

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* Lake Pepin. ** Bois Brule. † St. Croix. †† Little Falls. ‡ Tintonwan ‡‡ Rum river. § Milie Lacs. Green Bay.

found a war calumet beside the grave, and an earthen pot upset, in which the Indians had left fat buffalo meat, to assist the departed, as they say, in making his journey to the land of souls.

In the neighborhood of lake Buade are many other lakes whence issue several rivers, on the banks of which live the *Issati*, *Nadouessans*. *Tinthona* (which means prairie-men), *Ouadebathon*,* River-people, *Chongaskethon*, Dog or Wolf tribe (for *Chonga* among these nations means dog or wolf), and other tribes, all which we comprise under the name *Nadouessiou*. These Indians number eight or ten thousand warriors, very brave, great runners, and very good bowmen. It was by a part of these tribes that I and our two canoemen were taken in the following way:

The map accompanying Hennepin's work, as published at Paris, is reduced and reproduced in plate-pages 5 and 6. The Mississippi is conjecturally represented by a dotted line as flowing into the gulf of Mexico. The Illinois river is named *Seignelay*; the Wisconsin is called *Oisconsins*; above that is the river *Noire*, or Black river; the next above on the east is *R. des Bœufs;* the St. Croix is styled *R. du Tombeau*, and between it and Rum river, which is denominated the *St. Francois*, is a water connection of lakes and streams. There is one river above the St. Francis, but unnamed. The Mississippi is represented as having no tributaries from the west, and as flowing between two ranges of mountains from the Falls of St. Anthony to some distance below the Wisconsin. These "mountains" are none other than the bluffs of the river valley, made of horizontal strata cut by the river itself. Lake Pepin is named *Lac des Pleurs*; Mille Lacs is *Lac Buade*; lake Superior is *Condé ou Supérieur;* lake Michigan is *L. Dauphin ou Illinois;* lake Huron is *L. D'Orleans ou Huron;* lake Erie is *Conty ou Erie,* and lake Ontario is *L. Frontenac.* The coat of arms of France (probably as established by Du Luth) is represented at the most northwesterly point on the map, surmounted by a figure of the cross, and underneath it are inscribed these words:

Armes du Roy telle
quel[le] *sont grauée*
sur l' éscorce d' un
Chesne à l' endroit
marqué—A.

The unscrupulous Franciscan represents missions of his order established some leagues to the northwest of Mille Lacs, on the lower Mississippi, below the Illinois, as well as on lake Ontario. The gulf of California is named *Mer Vermeille*, and toward the north further are the *Straits of Anian*, supposed to lead to the "Northwest Passage," that phantom of all early explorers of North America.

*Warpetonwan.

1680, La Salle.

As Hennepin's account of his visit to the Falls St. Anthony has been much criticised for the exaggeration and the egotism which pervade it, the account of La Salle, who planned and despatched the party, is added. It is very probable that La Salle misrepresents Du Luth, and his travels in the upper Mississippi region. Charlevoix refers to Du Luth as a man of veracity, bravery and honor, and Le Clercq as a man of ability and experience.

LA SALLE ON THE DISCOVERY OF THE FALLS OF ST. ANTHONY.

La Salle's letter from Fort Frontenac, 22nd of August, 1682, is found in Part II. of Margry's *Découvertes et établissements des Francais dans l'ouest et dans le sud de l'Amérique septentrionale.* It contains internal evidence that La Salle derived his information of this expedition from Michel Accault, the real leader of the party. Translated into English as follows:

* * * * * The river *Colbert*, named *Gastacha* by the Iroquois and *Mississipy* by the *Outaouacs*, into which the river of the *Islinois*, called *Téakiki*, empties, comes from the northwest. I have caused it to be explored by two of my men, one of the name of Michel Accault and the other a Picard,* with whom the R. P. Louis Hennepin was associated, in order not to lose the opportunity to proclaim the gospel to those people who inhabit the upper country who had never heard it. They left Fort Creve Cœur in the afternoon of the 28th of February, with the Peace Calumet, which is a protection against the savages of these countries that they seldom violate. The said Michel Accault was somewhat acquainted with their language and their customs. He knew all their habits, and was a friend of several of those tribes to whom I sent him, where he had been acquainted; also, he is prudent, courageous and cool. They had about one thousand pounds of goods, such as are most valued in those regions, which, combined with the Peace Calumet, are never disregarded by those tribes, since they are nearly destitute of everything. They met at first a number of *Islinois*, who were ascending their river on a return to their village, who used every effort to induce them to abandon the journey. Michel Accault, who believed he should lose the honor of accomplishing the undertaking, encouraged by the example of the R. P. Louis Hennepin, who desired also to signify his zeal, and wishing to keep his word which he had given me to perish or to succeed, encouraged his comrade who was dispirited by the statements of the savages, and made him believe that the design of the Indians was to profit themselves with their merchandise, and to seize their provisions, and that they should not change the resolution which they had taken. In fact, they continued their journey down the river *Théakiki* until the 7th of March, 1680, when they fell in with a nation called *Tamaroa*, or *Maroa*, about two leagues from the mouth of the river where it reaches the Colbert. This nation numbers two hundred families or thereabout. They desired to conduct them to their village, situated at that time on the west coast of the Grand river, six or seven leagues above the entrance of the *Théakiki*. They would not follow them, but arrived, the same day, at the confluence of the two rivers, distant about fifty leagues from Fort Creve Cœur and ninety from the village of the *Islinois*. The river *Théakiki* is nearly everywhere of equal size throughout these ninety leagues, approaching the size of the Seine, in front of Paris, where it is confined within its own bed; but at various places, as at *Pimiteoui*,† one league to the east of Creve Cœur, and two or three other times below, it swells out to one or two leagues, over much space, while the two shores which border it below the village of the *Islinois*, are distant from each other about half a league. The land which they enclose between them is swampy, as well as the bed of the

*His real name was Du Gay. †Peoria.

river, and often inundated, especially after rains, which easily cause the streams to leave their channels, and expand them exceedingly, though often but a little in height. That of the *Islinois*, from their village to the Grand river, has a very deep and even bed. There is a border of timber nearly its whole length. The low grounds all sustain very large trees of all kinds, the slopes of the shores being generally covered. But immediately after one has crossed that which the river overflows from time to time, and ascended the banks, he finds only beautiful fields spread before his view, interrupted here and there with clumps of trees, which appear to be there only from necessity. These uninhabited plains extend sometimes even to the brink of the river, particularly about the environs of the village, and at sixty leagues to the east and northeast, where timber can be seen very rarely along the shore of the river; but below it is more generally bordered. The current is hardly perceptible when there has not been a great fall of rain. Although this happens only in the spring, it is perfectly navigable, nevertheless, throughout the year, for large boats as far as to the *Islinois*, and above that only for canoes, partly on account of the rapidity of the stream, and partly on account of the greater descent and the shoals which destroy its depth. Ice which they encountered in the Grand river stopped them at the mouth of the *Islinois* till the 12th of March. It washes on the south shore a steep rock, about forty feet high, suitable for the establishment of a fort, and on the opposite side extends a fine prairie, the limit of which cannot be seen, very good for cultivation. This place seems to me very well adapted for settlement, for many reasons which I have not time here to state, and I shall easily be able here to establish myself on my return. Just at and below *Pimiteoui* the river turns somewhat to the south, so that its *embouchure* is between 46 and 47 degrees of north latitude, and separated from the gulf of Mexico about 120 or 130 leagues. There are between Quebec and Montreal 43 leagues difference east and west; from Montreal to Fort Frontenac, 61 leagues; from the fort to Niagara, 65; from Niagara to the head of Lake Erie, 122; from there to the mouth of the river of the *Miamis*, 117; from there to the *Islinois*, 52; thence to *Pimiteoui*, or Creve Cœur, 27, and from Creve Cœur to the *Mississipi*, 18, which makes, altogether, about 500 leagues, or 24 degrees of longitude. The *Mississipi* appears, in leaving the mouth of the *Téatiki*, to go toward the south and southwest, and above there to come from the north and the northwest. It runs between two ranges of mountains of considerable height—much more than that of Mt. Valerian, which wind about in the same manner as the river, from which presently they fall back a little, leaving between them and its channel a prairie of some width, which is sometimes washed by the water of the river, in such a way that when along one coast it is bordered by the foot of a mountain, on the other is formed a bay, the head of which is terminated by a prairie or by a little patch of woods. The slopes of these shores, which are either of rubbish or of rock, are covered here and there with little oaks, and at other times with very beautiful herbs. The height of these mountains conceals the plains beyond, which are of rather poor land, quite different from that of the *Islinois*, though they sustain the same animals. The channel of the great river, although, for the most part of the width of one or two leagues, is entirely intercepted by a number of islands covered with wild timber, in which are so many vines that one can hardly pass through it. These are subject to inundation by the overflow of the river. They conceal generally the other shore of the river from view, so that it is rarely seen because of these islands. The bottom is very uneven, in ascending the river above the mouth of the *Islinois*. There are often shoals which cross the channel from one side to the other, over which canoes have difficulty in passing. It is true that in the current of the stream there is generally sufficient water to float the largest vessels; but there the stream is extremely rough and difficult to make headway. The *Mississipi* does not receive any considerable rivers from the west side, from the river of the *Islinois* up to the country of the *Nadouessioux*, where it receives that of the *Otoutantas*, *Paoté* and *Maskoutens*, who are the *Nadouessioux* of the East, about one hundred leagues from *Téakiki*.

THE WISCONSIN VALLEY AND THE ROUTE TO GREEN BAY.

Following the course of the *Mississipi*, one finds the river *Ouisconsing*, *Misconsing* or *Meschetz Odeba*, which flows between the bay of the *Puans* and the *Grand* river. It runs at first from the north to the south, to about the 45th degree of north latitude, and from there turns to the west and southwest, and after a course of sixty leagues, falls into the *Mississipi*. It is almost as large as that of the *Islinois*, navigable up to that bend where a canoe portage is made

1680, La Salle.]

across a divide and a swampy prairie to reach the river *Kakaling*, which falls into the bay of the *Puans*, and perhaps further. The *Misconsing* runs between two hill-ranges, which recede from time to time and leave between them and the river prairies of considerable size, and lands untimbered, which are sandy and sterile. At other times the patch which is between these ridges and the river is, in places, more low and marshy; and then it is covered with timber and is flooded by the overflows of the river. The mountains diminish imperceptibly in size as one ascends the river, and at length, about three leagues from the portage, the land becomes flat and marshy, open on the side from which the portage sets out, and covered with pines on the other side. The place where the canoes are carried is marked by a tree, on which there are two canoes rudely delineated by the savages; whence, after having walked about half a league, the river *Kakaling* [Fox] is found, which is only a rivulet rising from a marsh, and which winds about exceedingly, forming little lakes by enlarging itself, and then often becoming narrow. It is followed about 40 leagues, in the course of the bends it makes, and then is found the village of the *Outagamies*. At one-half league from the river, on the north side, before arriving there, the river falls into a lake which may be eight leagues long and three leagues wide; and after passing the village about two leagues are found the *Kakaling* rapids, which are difficult to descend on account of the swiftness of the water, the frequency of rocks which it encounters. and three waterfalls where it is necessary to carry the canoes and their burden. They continue six leagues. Three leagues below them, at the *debouchure* of this river into the bay of the *Puans*, is a house of the Jesuits, who truly have the key to the country of the beaver, where a brother blacksmith whom they have, and two companions, have changed more iron into beaver than the Fathers have of savages into Christians.

About 23 or 24 leagues to the north, or northwest, from the mouth of the *Ouisconsing* [Wisconsin], which has also a rocky coast on the south side and a beautiful prairie on the north, near to three beautiful basins or bays of quiet water, is the river *Noire* [Black], called *Chabadeba* by the *Nadouesioux*. This is of inconsiderable size, and at its mouth it is bordered on both sides by alders. Ascending about 30 leagues, all the way in nearly the same direction, we have the river *Bœufs* [Chippewa], about as large at its mouth as that of the *Islinois*. It is so called because of the number of these animals which are there found. It was explored ten or twelve leagues, and it remains of the same size and without rapids, bordered by mountains, which are separated farther, occasionally, so as to form prairies. There are several islands at its mouth, and it is lined with woods on both shores.

LA SALLE'S OPINION OF DU LUTH.

Thirty-eight or forty leagues higher is found the river by which Du Luth descended to the *Mississipi*. For three years he had been, contrary to orders, with a band of *coureurs des bois*, in the lake Superior region. He had acted very boldly there, publishing everywhere that at the head of his braves he did not fear the *Grand Prévost*, and that he would forcibly make him grant him amnesty. The *coureurs des bois*, to whom he first had revealed his pretence, have been several times in the settlement, and have returned carrying merchandise and furs, of which they have meantime despoiled lake Superior, from all the approaches to which they have kept out the *Outaouac* during this year, so that they could not descend to Montreal.

During this time and while he was at lake Superior, the *Nadouesioux*, invited by the presents which the late Sieur Randin had made them in behalf of Count Frontenac, and the *Sauteurs*, who are the savages that bring the most peltries to Montreal, and who dwell at lake Superior, wishing to observe the repeated injunctions of said Frontenac, concluded a peace, which was to unite the nation of the *Sauteurs* to the French, and to allow them to go in trade to the country of the *Nadouesioux*, distant about 60 leagues to the west from lake Superior. Du Luth, in order to conceal his desertion, took this occasion to give it some excuse, and causes himself, with two of his fellow-deserters to pass as an envoy of the Count and charged with his orders, for the purpose of negotiating that peace--during which his comrades negotiate for a great number of beaver. He had a number of conferences with the *Nadouesioux*, and as he had no interpreter, he bribed one of mine, named Faffert, till then a soldier at Fort Frontenac. Finally, the *Sauteurs* having been several times back and forth to the *Nadouesioux*, and the *Nadouesioux* to the *Sauteurs*, seeing that there was nothing to fear, and that it was possible to increase the number of their beaver, he

sent there this Faffert, by land, with some *Nadouesioux* and *Sauteurs*, who returned in company with him. This young man having made a report on his return of the number of beaver which he might obtain from that direction, he resolved to attempt to go there himself; and under the guidance of a *Sauteur* and a *Nadouesioux*, with four Frenchmen, they ascended the *Nemitsakouat*, whence, by a short portage, he descended into that in which he said he had passed forty leagues of rapids; and having seen that the *Nadouesioux* were further down with my men and the Father,‡ having gone down the river from the village of the *Nadouesioux* where they had already been, he comes on to find them. He returned to the village, whence they all together re-descended and by the way of the river *Ouisconsing* reached Montreal. There he was considerably elated at having been one of their party, having even insulted the commissaries, and also the Deputy Procureur, (at present the Procureur-General), named d'Auteuil. Mons. le Comte de Frontenac had him arrested, and took measures to keep him in prison in the bastile at Quebec, intending to send him to France on the certification of the facts by Mons. l'Intendant, to the end that the amnesty granted to his *coureurs des bois* should not result in his discharge.

To know who this Du Luth is, it is necessary that you be informed by Mons. Dalera. Meantime he pretends to have made a considerable discovery, and to demand this country as if to the advantage of the *Islinois*, a proceeding which is quite agreeable, and which he hopes may compensate for his rebellion. Secondly, there are only three routes by which to go there—one is by lake Superior, the second by the bay of the *Puans*, and the third by the *Islinois* and the territory that is covered by my commission. The first two lie under suspicion, and it will not be necessary to open to him the third to my disadvantage, he not having incurred any expense, and having made great gain without risk, at the same time that I have endured great fatigues, perils and losses. Further, through the *Islinois* is a detour of three hundred leagues for him. For the greater part of the country of the *Nadouesioux* is not that which he has discovered. It has been known for a long time, and the R. P. Hennepin and Michel Accault were there before him. Even that one of his fellow-deserters who was there, was one of my soldiers whom he bribed. Furthermore this country is not habitable, little adapted to cultivation, having only marshes full of wild rice (*folle avoine*) on which the people live; and there can be derived from this discovery no advantage whether it be attributable to my men or to Du Luth, because the streams are not navigable. But the king having granted us the trade in buffalo hides, this would be ruined in going to and coming from the *Nadouesioux* by any other route than by lake Superior by which Count Frontenac has power to send him there in search for beaver, in pursuance of the authority which he has to grant permits. But if they go by way of the *Ouisconsing*, where for the present the chase of the buffalo is carried on, and where I have commenced an establishment, they will ruin the trade of which alone I am laying the foundation on account of the great number of buffaloes which are taken there every year, almost beyond belief.

LA SALLE'S DESCRIPTION OF THE FALLS OF ST. ANTHONY.

Ascending still the *Mississipi*, at twenty leagues above this river, are found the falls which those whom I sent, and who passed there first of all, named from St. Anthony. They have the height of thirty or forty feet, and there the river is also narrow. There is an island in the midst of the fall, and the two shores of the river are no longer bordered by mountains, which diminish insensibly up to there;* but the land on both sides is covered with light timber,** as we style it, that is to say, oaks and other hard woods, standing far apart, such as grow only in poor lands. There are also some prairies. Here the canoes are carried about three or four hundred steps, and eight leagues above is the river of the *Nadoesioux*, on the west† side. It is narrow at its entrance and drains a poor country covered with shrubs through about fifty leagues, where it terminates in a lake called lake of the *Issati*, which spreads over a great marsh where grows the wild rice, at the point of its outlet in this river.

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* Hennepin says the mountains extend only to the mouth of the Wisconsin. ‡ Hennepin.

** Perhaps this *bois clairs* means *deciduous trees.*

† This is evidently an error of some copyist, as the river, which is well known as Rum river, is an eastern tributary of the Mississippi.

1680, La Salle.]

CAPTURE OF ACCAULT AND HIS PARTY.

The *Mississipi* comes from the west, but it was not followed because of the adventure which happened to R. P. Louis, Michel Accault and their comrade. This affair happened in this way. After having pursued the course of the *Mississipi* till the 11th of April about three o'clock in the afternoon, rowing along the shore on the side of the *Islinois*, a band of a hundred *Nadouesioux* warriors who were going to slaughter some of the *Tchatchakigona*,* were descending the same river in thirty-three canoes made of birch bark. There were with them three women, and one of those slaves who serve the women, although they are men, whom the *Islinois* call *Ikoueta*. They passed along on the other side of some islands, and so several of the canoes had descended below that of the Frenchmen; but descrying it they all gathered together, and those who had gone below returning with all haste, they easily encompassed it about and closed up the way. There was one party of them on the land, who surrounded them on that side. Michel Accault, who was the leader, presented them the calumet. They accepted it and smoked, after having made a circle on the ground covered with straw where they caused the Frenchmen to sit down. Immediately two of the old men began to weep for the death of those of their kinsmen whom they designed to avenge; and after having taken some tobacco they made our men embark, and cross over first to the other side of the river. They followed on, after having uttered three cries, and pushed their canoes with all haste. On disembarking Michel Accault presented them with twenty knives and a measure and a half of tobacco, which they accepted. They had already stolen a demi-pique and several other small articles. They then traveled together ten days, without giving any sign of discontent or of evil design; but on the 22nd of April, having reached the islands where they had slain some *Maskoutens*, they put the two dead whom they were going to avenge, and whose bones they carried with them, between P. Louis and Michel Accault. This is an ambiguous ceremony which they perform before their friends in order to incite them to compassion, and to cause them to make presents to cover them with, and before their slaves whom they take in war to make them understand that they must expect a treatment like to that which they render to the dead. Michel Accault unfortunately did not understand this nation, and there was not one slave of the other nations whom he did understand, which hardly ever happens, all the tribes in America having a number of those to whom they have granted life in order to replace their dead, after having sacrificed a great number to satisfy their vengeance. This enables them to understand almost all the tribes, since they become acquainted with three or four languages of those tribes who go farthest in war, such as the *Iroquois*, the *Islinois*, the *Akonsa*, the *Nadouesioux* and *Sauteurs*. Accault understood all these except the *Nadouesioux*; yet there are among them a number who have been slaves with the others, or who had come from them and have been taken in war, but by chance he did not find one of them in this company to interpret him to the others. It was necessary to give a full case of merchandise, and the next day twenty-four hatchets. At eight leagues below the falls of St. Anthony they determined to go by land to their village, distant about sixty leagues from the place of disembarking, not being willing to carry the goods of our men, nor to conduct them there by water. They made them then give up the rest of their hatchets, which they shared amongst themselves, promising to repay them well at the village; but two days afterward they divided also among themselves two cases of merchandise, and, falling into a quarrel concerning the division both of the merchandise and of the tobacco, each chief claiming to be the master, they separated in jealousy as they led the Frenchmen toward the village, where they promised to make satisfaction with beaver skins which they said they had in great number.

THE PARTY AT MILLE LACS.

There they were received well, and at once made a banquet for Accault, who was in a different village from that where the R. P. Louis and the Picard were, but who were there also well received except that, several sportive young men having told the Picard to sing, the fear that he experienced made a coward of him, since only slaves sing on arriving at a village. Accault, who was not there, was not able to prevent it; but they were subjected to no other treatment like that

*Hennepin says *Outagamis*, and Parkman says *Miamis*.

which they impose on slaves. They were never tied; and after that, they promised the return of that which their young men had seized, since Accault, who had found some men to whom he could make himself understood, made them comprehend the importance of it, when they immediately danced two calumets, and offered several beaver skins with which to begin the payment; but as these were too little Accault would not be satisfied. Six weeks afterward, all having returned to the *Ouisconsing* with the *Nadoesioux* on a hunt, the R. P. Louis Hennepin and the Picard resolved to go to the mouth of the river where I had promised to send messages, as I had done by six men, whom the Jesuits deceived, telling them that the R. P. Louis and his fellow travelers had been slain. They allowed them to go there alone, to show them they were not regarded as slaves, and that Du Luth is wrong in boasting of having released them from slavery, since on the journey and as long as their food lasted, the Frenchmen had the best, although they suffered great hunger when the savages were without food. Jealousy was the sole cause of the pillage, because, as they were from different villages, and but few from that where the Frenchmen were to go, they did it in order to secure their portion of the merchandise, of which they feared they would receive none if they once entered the village where the Frenchmen were to go; but the old men blamed greatly the young men, and offered and even began to make the restitution that Accault ought to have. They regarded the French so little as slaves that they gave to R. P. Louis and the Picard a canoe to go in search of my messengers. All that Du Luth can say is, that having come to the place where the Father and the two Frenchmen had gone in a hunt from the village, where, along with them he went for the first time when they returned there, he made it easier for them to return sooner than they would have done, because messengers whom I had sent had been dissuaded from going on; but we should have been in search for them the following spring if we had not learned, as we did in the winter, of their return by way of the *Outagamis*. Accault found himself so little a slave that he was intending to remain there until he should receive the payment that had been promised him.

LA SALLE JUSTIFIES THE EXPEDITION.

I do not doubt but several things may be said of this expedition.

(1.) That I ought to have sent a man who understood the language. To this it is easy to reply that I did not send Accault to the *Nadouesioux* but to explore the *Grand* river, that he understood the language of those who were nearest, such as the *Otontanta* the *Aiounouea*, the *Kikapou* and the *Maskoutens Nadouesioux* through whom he was to pass first, and to take an interpreter from there for going further on, it being impossible to send those who understood all the languages.

It will be said also that in the first expeditions it was not necessary to go with so much merchandise, which tempts the young men, already under bad subjection to the elders, and leads them to deeds which they would not do if they saw nothing which tempted them. To this I reply that, sending to those nations with whom we had acquaintance through the *Islinois*, and to whom Accault was a friend, because he had passed two winters and a summer there, during which time he had seen several of the most important of their villages where he was to pass, whom he had won by little presents, there was nothing to fear, at least in all probability—there being no likelihood that they would encounter an army of the *Nadouesioux* three hundred leagues from that country. (2) These voyages being difficult, those who undertake them do it only through the hope of gain, which they could not accomplish without merchandise. (3) Several of those savages having come to the *Islinois* while we were there, and having seen the merchandise which we had there, they would be filled either with anger or jealousy, believing that going into their country with but little would be either from a want of friendship for them or from some evil design. Finally, wishing to attract them to come and buy of our commodities and to make them accustomed to the use of them, it would be necessary to have a somewhat considerable quantity of them.

I have thought it proper to give you this account of the adventures of this canoe, because I do not doubt its being spoken of, and if you wish to confer with Father Louis Hennepin, Recollect, about it, who has returned to France, it is well to know something of it, for *he will not fail to exaggerate everything; it is his character;* and to me even he has written as if he had been nearly burnt up, although he has not been even in danger of it; but he believes it is honorable in him to act in that way, and *he speaks more in accordance with what he wishes than what he knows.*


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Lac des Assenipoils
Missions des Recollects
Chongaskobé ou Nation des Forts
Les Hanctons
Nadouevans
Lac Buade
Oüa de Battons ou gens de Riuiere
Tinthonha ou gens des Prairies
Issati
Sault de S.t Antoine de Padoüe
Lac de Condé ou Superieur
Missilimackinac
Lac des Pleurs
Portage
Baye des Puants
Les Illinois
Fort de Crevecoeur
Mission des Recollects
des Miamis
Portage
Lac de Conty ou Erie
Forte de Frontenac
MontReal
Quebec
Tadoussac
ACCADI
N.lle ANGLETERRE
HOLANDE
F. de Conty
Uirginie
R. Colbert
La Louisiane
FLORIDE
C. de la Floride
Canal de Bahama
MER VERMEILLE
MEXIQUE OU NOUVELLE ESPAGNE
Les Mines de S.te Barbe
Mexique
GOLFE DE MEXIQUE
Trop
I. de Cuba
I. de S.t Domingue
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NOUVELLE BRETAGNE

I. de Terre Neuue

I Perget

Grand Banc.

IRLANDE

ANGLETERRE

La Manche

PARTIE DE FRANCE

PARTIE D'ESPAGNE

I Azores

I Canaries

Partie d'AFRIQUE

MER DE CANADA

ique du Cancer

Isles Antilles Françoises

I QUE

IONALE

ORIENT

L'TRIOMPHE DE LA CROIX

CARTE
DE LA
NOUUELLE FRANCE
ET DE LA
LOUISIANE
Nouuellement decouuerte
dediée
Au Roy
l'an 1683.
Par le Reuerend Pere
Louis Hennepin
Missionaire Recollect
et Notaire Apostolique

N. Guerard.

310 320 330 340 350 360

1688, La Hontan.]

Hennepin's account of the capture and captivity among the Nadouesioux is more circumstantial than that of La Salle, but in the main similar to his. Hennepin, however, recounts various indignities and deprivations to which they were subjected, regarding himself as a prisoner and a slave while at lake Buade.

"In the beginning of July" the Frenchmen set out with the Indians on a grand buffalo-hunt down the Mississippi. In four days they reached the mouth of the St. Francis, or Rum river,* where they halted for the purpose of making more canoes; while Hennepin and the Picard proceeded down the Mississippi alone in a poor canoe intending to reach the Wisconsin river, where La Salle had agreed to send messages to them. It is probable, therefore, that Hennepin first saw the Falls of St. Anthony on the 5th day of July, 1680,† in company with the Picard alone. On the 11th they were not far from the Wisconsin, after some adventure and delay.

It is plain, also, that Hennepin saw the Falls of St. Anthony before he encountered Du Luth, and may be accredited with the first recorded examination of the Mississippi between the Wisconsin river and the Rum river, and Du Luth with the first visit to the St. Croix river, which he probably descended from the headwaters of the Bois Brulé, known then as the *Nemissakouat.* (Plate-pages 5 and 6.)

LA HONTAN IN MINNESOTA.

Baron La Hontan's work, in which he describes a voyage on the river Long, made by himself in the winter of 1688-89, is largely fictitious. He states that he traveled sixty days in winter on a river 500 miles long, at the mouth of which are many rushes, which entered the Mississippi from the west. Mr. J. N. Nicollet regards the river that La Hontan entered as the Cannon river. It has also been suggested that on ascending this river to its source he passed into the Minnesota river, through some of the canoe routes and lakes which cause the headwaters of the Cannon to interlock with those of the Le Sueur. Keating, the chronicler of Major Long's expedition to the sources of the St. Peter, supposed that the Root river

* On modern maps the name of St. Francis is applied to the next stream above the Rum, and that may have been the river to which Hennepin referred in his journal, since by a portage the route by it to lake Buade is much less than the course of the Rum river, and the Indians may have followed that route.

† The Minnesota Historical Society celebrated July 5, 1880, as the Bi-centennial of the discovery of the Falls of St Anthony.

was the one referred to by La Hontan, while others, with perhaps as good reasons, think he actually entered the Minnesota river. The very general and vague description which he makes of the physical character of the valley of the *Rivière Longe* will apply with equal correctness to either of these valleys, but the direction of the river he says he explored, as represented on his map, can only apply to the Root river. The Root river is less likely to be frozen in winter than either of the others, owing to the fact that it is derived largely from copious springs and subterranean streams that flow from the rocky bluffs between which it runs (see the geology of Fillmore county), and is a larger stream than the Cannon, and further south.*

LE SUEUR IN THE MINNESOTA VALLEY.

Although there is mention made in the treatise of Nicholas Perrot, a trader and interpreter, and later an agent of the government in the upper Mississippi region, *on the habits, customs and religions of the savages of North America,* of the St. Croix and St. Peter's rivers, there seems to have been no further extension of knowledge of the geography of the region till the time of Le Sueur.

The first accredited exploration of the Minnesota valley was made by Le Sueur, who first visited the upper Mississippi in 1683, with Perrot, in the interests of trade. He built a trading-post on Isle Pelée, a few miles below Hastings, in 1695, and in 1699 received a commission from D'Iberville to visit and examine a copper mine which he claimed to have discovered in the country of the Ioways. In April, 1700, with a single shallop and about twenty-five persons, he started from the settlements on the lower Mississippi for the mouth of the Minnesota river, where he arrived on the 19th of September; and on the last day of the same month, being stopped by ice forty-four leagues above its union with the Mississippi, he determined to build his fort. His narrator, Penicaut, who was also his carpenter, states that this place was *a league up the Green river* (now the Blue Earth) *on a point of land a quarter of a league distant from the woods.* This river was so called "because it is of that color by reason of a green earth, which, loosening itself from the copper mines, becomes dissolved in it and makes

* Coxe in French's Hist. Col. of Louisiana, Part II., p. 233, says lake Pepin was *above* the "Long" river of La Hontan.

it green." Four leagues above the mouth of the St. Croix, at the mouth of a small lake, Le Sueur saw a large mass of copper. "It is on the edge of the water, in a small ridge of sandy earth, on the west of this lake."* The blue, or green, earth, which was mistaken for an ore of copper by Le Sueur, was obtained in a mine three-quarters of a league distant from the fort. The fort was named L'Huillier, from one of the chief collectors of the king, who had assayed the ore in Paris in 1696. Having spent the winter at his fort, in the spring of 1701 he descended the Mississippi with a large quantity of the ore, 4,000 pounds of which were sent to France. He intended to return, but in 1703 the garrison left by him arrived at Mobile, in charge of Derague, having been compelled to abandon the post on account of ill treatment by the Indians, and lack of supplies. This river is further described as being near a range of hills (Keating says *mountains)* ten leagues long that seemed to be composed of the same substance. Charlevoix says: "After removing a burnt, black crust, as hard as a rock, the copper could be scraped with a knife." Penicaut says: "This mine is situated at the beginning of a very long mountain which is upon the bank of the river, so that boats can go right to the mouth of the mine itself. At this place is the green earth, which is a foot and a half in thickness, and above it is a layer of earth as firm and hard as stone, and black and burnt like coal by the exhalation from the mine. The copper is scratched out with a knife. There are no trees upon this mountain. If this mine is good, it will make a great trade, because the mountain contains more than ten leagues running of the same ground. It appears, according to our observations, that in the very finest weather there is continually a fog upon this mountain."†

Mr. W. W. Mather, who accompanied Featherstonhaugh, says that he "found the green earth, but it contained no copper." Mr. Featherstonaugh is very positive in his denial of the existence of any copper in that locality, and pronounces the whole account a fabrication by Le Sueur.

It is more probable that Le Sueur was honest in his conviction, but was mistaken in the value of the *green earth* which he mined. Charlevoix, La Harpe and Penicaut agree in the statement of the main facts, and if

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* Neill's *Minnesota*, p 161.
† Translated by A. J Hill, in the Third Volume of the *Minnesota Historical Collections.*

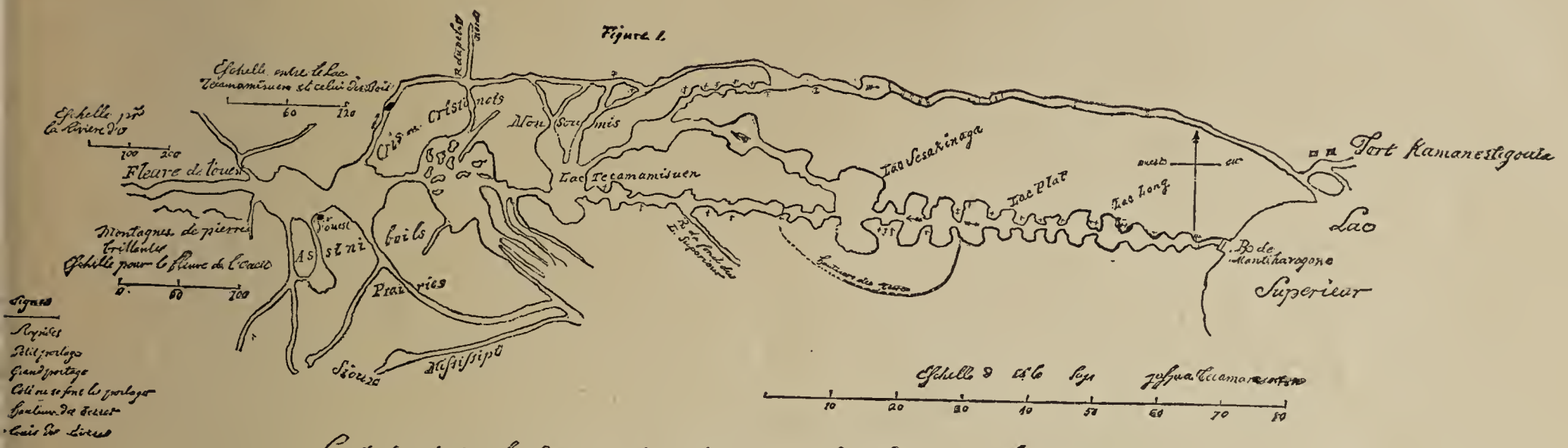
Le Sueur took a quantity to France for assay, it is not likely that he wilfully falsified the facts as to its origin and nature. There can be no question of the existence of both green and blue earth in that vicinity. The shales of the Cretaceous are common in that part of the state, and there is also a clayey deposit, supposed to be of the Cretaceous, found lying unconformably in eroded places in the Cambrian limestones of that valley. The hard, black, burnt crust mentioned, which, on being scraped, exhibited the copper, can be no other than the ironstone incrustation that covers the Cambrian limestones, as seen at Mankato, wherever the Cretaceous clays lie unconformably over them.

OCHAGACH'S MAP.

The oldest map of the region west of lake Superior was traced by a chief of the Assiniboines, named Ochagach, for Verendrye, in 1730, and was taken by Verendrye to the governor of Canada to induce him to equip an exploring expedition in search of a passage to the western ocean. This map was sent to Paris and deposited in the *Archives de la Marine.* A reduced transcript of this map is given below (Fig. 1.), derived from a facsimile tracing in the Department of American History of the Minnesota Historical Society, through the courtesy of Mr. Neill. It was reproduced on the margin of Buache's map of 1754, and its contents are also incorporated in Buache's general *Carte Physique.* (V. Plate 4.) It gave rise to the important and extensive explorations of Sieur Verendrye and his sons and nephew (Jeremaye), which extended through several years and covered the valleys of the Assiniboine and Saskatchawan, as well as those of the upper Missouri and the Yellowstone, to the "shining mountains."

The water-course rudely represented on this chart, extending westward from lake Superior, is that which afterward became the international boundary. The river marked "R. de fond du L. Supérieur" is evidently that which is now known as Vermilion river, north of Vermilion lake, and derived its designation by Ochagach from the fact that it furnished the main route, for east-bound canoes, to the head of lake Superior and the south shore of that lake; and, for a similar reason, that marked "Mississipi" represents the Big Fork river. The "Fleuve de l'ouest" is evidently the present Saskatchawan river, flowing into lake Winnipeg from the west,

and rising in the Rocky Mountains. Plate IV however, represents the river of the west as flowing into the Pacific, rising in lake Brochet in the neighborhood of the sources of the Missouri.



Carte tracée par le Sauvage Ochagach et autres. laquelle a donné lieu aux découvertes des Officiers Francois representées dans la Carte cy après

JONATHAN CARVER.

Jonathan Carver in 1766 was the next to contribute to the geography and natural history of Minnesota. By this time the route for canoes along the northwestern boundary had become well known, and was annually traversed by hundreds of *coureurs des bois* and by thousands of Indians conveying furs to the lake shore, where at Fort Charlotte, now Grand Portage, they were exchanged for supplies from Montreal, or were despatched in the light birch canoes to the distant markets of Montreal and Quebec. This route had been mapped by Ochagach in 1730 for Verendrye, and by Jeffrey in 1762.

Carver ascended the Mississippi from the mouth of the Wisconsin to the falls of St. Anthony, of which he gives the fullest description up to that time, and, passing above the falls, reached the St. Francis river. Thence he descended, and made his way up the Minnesota river as far as the mouth of the Waraju, or Cottonwood, where he spent seven months—the winter and spring of 1766-67. Subsequently descending the Mississippi to Prairie du Chien, he passed through Wisconsin to lake

FIGURE 2.

Superior and Grand Portage, returning to Boston by way of the north shore of lake Superior, Michillimackinac and Detroit.

Carver's book* states that he intended at first to pass by way of the lake of the Woods and lake Winnipeg, to the "heads of the river of the West, which, as I have said before, falls into the straits of Annian, the termination of my intended progress," but falling short of supplies for presents to the Indians, and being unable to obtain them of the traders at Grand Portage, he was compelled to abandon his great exploration.

*Travels through the interior parts of North America, in the years 1766, 1767 and 1768. By J. Carver, Esq., Captain of a company of provincial troops during the late war with France, Dublin, 1779.

1766, Carver.]

Passing through lake Pepin, he gives the usual description, adding the following respecting the fauna:

CARVER ON LAKE PEPIN AND THE MISSISSIPPI RIVER.

Great numbers of fowl also frequent this lake and rivers adjacent, such as storks, swans, geese, brants and ducks; and in the groves are found plenty of turkeys and partridges. On the plains are the largest buffaloes of any in America. Here I observed the ruins of a French factory, where it is said Captain St. Pierre resided and carried on a very great trade with the Naudowessies, before the reduction of Canada.

The Mississippi, as far as the entrance of the river St. Croix, thirty miles above lake Pepin, is very full of islands, some of which are of considerable length. On these also grow great numbers of the maple or sugar tree, and around them vines loaded with grapes creeping to their very tops. From the lake upwards few mountains are to be seen, and those but small.

CARVER ON CARVER'S CAVE.

About thirty miles below the falls of St. Anthony, at which I arrived the tenth day after I left lake Pepin, is a remarkable cave of an amazing depth. The Indians term it *Wakon-teebe*, that is the Dwelling of the Great Spirit. The entrance into it is about ten feet wide, the height of it five feet. The arch within is near fifteen feet high and about thirty feet broad. The bottom of it consists of fine, clear sand. About twenty feet from the entrance begins a lake, the water of which is transparent, and extends to an unsearchable distance; for the darkness of the cave prevents all attempts to acquire a knowledge of it. I threw a small pebble toward the interior parts of it with my utmost strength; I could hear that it fell into the water, and notwithstanding it was of so small a size, it caused an astonishing and horrible noise that reverberated through all those gloomy regions. I found in this cave many Indian hieroglyphics, which appeared very ancient, for time had nearly covered them with moss, so that it was with difficulty I could trace them. They were cut in a rude manner upon the inside of the walls, which were composed of a stone so extremely soft that it might be easily penetrated with a knife; a stone everywhere to be found near the Mississippi. The cave is only accessible by ascending a narrow, steep passage that lies near the brink of the river.

At a little distance from this dreary cavern is the burying-place of several bands of the Naudowessie Indians. Though these people have no fixed residence, living in tents, and abiding but a few months on one spot, yet they always bring the bones of their dead to this place, which they take the opportunity of doing when the chiefs meet to hold their councils and to settle all public affairs for the ensuing summer.

Ten miles below the falls of St. Anthony the river St. Pierre, called by the natives Wadapaw Menesotor, falls into the Mississippi from the west. It is not mentioned by Father Hennepin, although a large, fair river; this omission, I conclude, must have proceeded from a small island that is situated exactly at its entrance, by which the sight of it is intercepted. I should not have discovered this river myself had I not taken a view, when I was searching for it, from the high lands opposite, which rise to a great height. Nearly over against this river I was obliged to leave my canoe, on account of the ice, and travel by land to the falls of St. Anthony, where I arrived on the 17th of November. The Mississippi, from the St. Pierre to this place, is rather more rapid than I had hitherto found it, and without islands of any consideration.

CARVER AT THE FALLS OF ST. ANTHONY.

The falls of St. Anthony received their name from Father Louis Hennepin, a French missionary, who traveled into those parts about the year 1680, and was the first European ever seen by the natives. This amazing body of waters, which are about 250 yards over, form a most pleasing cataract; they fall perpendicularly about thirty feet, and the rapids below, in the space of 300 yards more, rendered the descent considerably greater; so that when viewed at a

distance they appear to be much higher than they really are. The above-mentioned traveler has laid them down at about sixty feet; but he has made a greater error in calculating the height of the falls of Niagara, which he asserts to be 600 feet, whereas, from later observations accurately made, it is well known that it does not exceed 140 feet. But the good father, I fear, too often had no other foundation for his accounts than report, or, at best, a slight inspection.

Fig. 3. Carver's Sketch of the Falls of St. Anthony, 1766.

In the middle of the falls stands a small island about forty feet broad and somewhat longer, on which grow a few cragged hemlock and spruce trees, and about half way between this island and the eastern shore is a rock, lying at the very edge of the fall in an oblique position, that appeared to be about five or six feet broad and thirty or forty feet long. These falls vary much from all the others I have seen, as you may approach close to them without finding the least obstruction from any intervening hill or precipice.

The country around them is extremely beautiful. It is not an uninterrupted plain where the eye finds no relief, but composed of many gentle ascents which, in the summer, are covered with the finest verdure, and interspersed with little groves that give a pleasing variety to the prospect. On the whole, when the falls are included, which may be seen at the distance of four miles, a more pleasing and picturesque view cannot, I believe, be found throughout the universe. I could have wished that I had happened to enjoy this glorious sight at a more seasonable time of the year, whilst the trees and hillocks were clad in Nature's gayest livery, as this must have greatly added to the pleasure I received; however, even then, it exceeded my warmest expectations. I have endeavored to give the reader as just an idea of this enchanting spot as possible in the plan annexed; but all description, whether of the pencil or the pen, must fall infinitely short of the original.

At a little distance below the falls stands a small island, of about an acre and a half, on which grow a great number of oak trees, every branch of which, able to support the weight, was full of eagles' nests. The reason that this kind of birds resort in such numbers to this spot is that they are here secure from the attacks either of man or beast, their retreat being guarded by the

rapids, which the Indians never attempt to pass. Another reason is that they find a constant supply of food for themselves and their young, from the animals and fish which are dashed to pieces by the falls and driven on the adjacent shore.

Having satisfied my curiosity, as far as the eye of man can be satisfied, I proceeded on, still accompanied by my young friend,* till I had reached the river St. Francis, near sixty miles above the falls. To this river Father Hennepin gave the name of St. Francis, and this was the extent of his travels, as well as mine, toward the northwest. As the season was so far advanced, and the weather extremely cold, I was not able to make so many observations on these parts as I otherwise should have done.

It might however, perhaps, be necessary to observe that in a little tour I made about the falls, after traveling fourteen miles by the side of the Mississippi, I came to a river nearly twenty yards wide which ran from the northeast, called Rum river. And on the 20th of November came to another termed Goose river, and about twelve yards wide. On the 21st I arrived at the St. Francis which is about thirty yards wide. Here the Mississippi itself grows narrow, being not more than ninety yards over; and appears to be chiefly composed of small branches. The ice prevented me from noticing the depth of any of these rivers.†

The country in some places is hilly, but without large mountains, and the land is tolerably good. I observed here many deer and carraboes, some elk, with abundance of beavers, otters and other furs. A little above this to the northeast, are a number of small lakes, called the Thousand lakes; the parts about which, though but little frequented, are the best within many miles for hunting, as the hunter never fails of returning loaded beyond his expectations.

CARVER ASCENDS THE MINNESOTA.

On the 25th I returned to my canoe which I had left at the mouth of the river St. Pierre; and here I parted with regret from my young friend the prince of the Winnebagoes. This river being clear of ice by reason of its southern situation, I found nothing to obstruct my passage. On the 28th, being advanced about forty miles, I arrived at a small branch that fell into it from the north; to which as it had no name that I could distinguish it by, I gave my own, and the reader will find it in the plan of my travels denominated Carver's river. About forty miles higher up I came to the forks of the Verd and Red Marble rivers, which join at some little distance before they enter the St. Pierre.

The river St. Pierre, at its junction with the Mississippi, is about a hundred yards broad, and continues that breadth nearly all the way I sailed upon it. It has a great depth of water, and and in some places runs very briskly. About fifty miles from its mouth are some rapids, and much higher up there are many others.

I proceeded up this river about two hundred miles, to the country of the Nadowessies of the Plains, which lies a little above the forks formed by the Verd and Red Marble rivers [*i. e.* The Blue Earth and Watonwan rivers.—N. H. W.] just mentioned, where a branch from the south nearly joins the Messorie river.‡ By the accounts I received from the Indians I have reason to believe that the river St. Pierre and the Messorie, though they enter the Mississippi twelve hundred miles from each other, take their rise in the same neighborhood, and this within the space of a mile. The river St. Pierre's northern branch [*i. e.* The main river.—N. H. W.] rises from a number of lakes [Big Stone L.—N. H. W.] near the Shining Mountains, and it is from some of these, also, that a capital branch [Red River of the North.—N. H. W.] of the river Bourbon [Nelson river.—N. H. W.] which runs into Hudson's bay, has its sources. * * * I have learned that the four most capital rivers of North America, viz., the St. Lawrence, the Mississippi, the river Bourbon, and the Oregon, or River of the West, have their sources in the same neighborhood. The waters of the three former, are within thirty miles of each other; the latter, however, is rather farther west.¿

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*A young "prince" of the Winnebago Indians whom he had encountered a few miles below the Minnesota river.

†The distance to Rum river is approximately correct. The Goose river is now the Crow river, and the Elk, which is now sometimes styled the St. Francis river (though Hennepin applied the name to the outlet of L. Buade) is the only one to which Carver can refer, said to be 30 yards wide.

‡The sources of the Waraju river are near those of the Rock river, the latter being a branch of the Missouri. Carver wintered at the mouth of the Waraju (or Cottonwood) river.

¿This idea of the proximity of the source of the Oregon to those of the other rivers mentioned is represented on the map accompanying Du Pratz' *Histoire de la Louisiane.*

This shows that these parts are the highest lands in North America; and it is an instance not to be paralleled on the other three quarters of the globe, that four rivers of such magnitude should take their rise together, and each, after running separate courses, discharge their waters into dfferent oceans at the distance of two thousand miles from their sources.

CARVER'S OPINION OF THE MINNESOTA VALLEY.

The river St. Pierre, which runs through the territories of the Naudowessies, flows through a most delightful country, abounding with all the necessaries of life that grow spontaneously, and with a little cultivation it might be made to produce even the luxuries of life. Wild rice grows here in great abundance; and every part is filled with trees bending under their loads of fruit, such as plums, grapes and apples; the meadows are covered with hops, and many sorts of vegetables; whilst the ground is stored with useful roots, with angelica, spikenard, and ground-nuts as large as hen's eggs. At a little distance from the sides of the river are eminences from which you have views that cannot be exceeded even by the most beautiful of those I have already described; amidst these are delightful groves, and such amazing quantities of maples that they would produce sugar sufficient for any number of inhabitants.

THE ST. PETER SANDSTONE.

A little way from the mouth of this river, on the north side of it, stands a hill, one part of which, that toward the Mississippi, is composed entirely of white stone, of the same soft nature as that I have before described; for such indeed is all the stone in this country. But what appears remarkable is, that the color of it is as white as the driven snow, The outward part of it was crumbled by the wind and weather into heaps of sand, of which a beautiful composition might be made; or, I am of opinion, that when properly treated, the stone itself would grow harder by time, and have a very noble effect in architecture,

Near that branch which is termed the Marble river, is a mountain, from which the Indians get a sort of red stone, out of which they hew the bowls of their pipes. [This, doubtless, is a reference to the *catlinite* of Pipestone county.—N. H. W.]

Carver's work contains a dissertation on the origin, manners, customs, religion and language of the Indians, followed by a chapter on the leading species of animals, particularly the game animals, and on the trees, shrubs, roots, herbs and flowers of the interior parts of North America, but as he assigns none of them to their habitats, they cannot be claimed as indigenous to Minnesota, though doubtless most of them are.

Carver gives a description and location of many of the lakes northwest from Grand Portage, and of some in northern Minnesota, about the head-waters of the Mississippi and the Red river of the North, but as he did not visit them, and his account is based wholly on descriptions derived from the Indians and traders, it is quite incorrect in some particulars. He states that "the most remote source" of the Mississippi river is a lake not far from Red lake, a little to the southwest, called White Bear lake, of about the same size as Red lake.* It is now known as lake Whipple.

*The map accompanying Carver's book (London edition) shows the general inaccuracy of Carver not only in depicting his own observations, but also in reproducing those of earlier writers. "The country of peace" and the Red Marble river, are so named doubtless from the red quartzyte and catlinite (the latter used for making the peace calumet) about the headwaters of the Watonwan and Cottonwood rivers, and should be represented on the west Fork of the Verd river instead of the east. The mountains of "The country of peace" are a poetic exaggeration, like Hiawatha's "Mountains of the Prairie." Compare Keating's strictures upon Carver in Long's Expedition in 1823, Vol. 1, p. 336.

1805, Pike.]

Captain Carver did not give up his design of reaching the "straits of Annian" through the headwaters of the great streams flowing east and west from Minnesota, and organized a party to carry out the purpose in which he had failed, on his return to England. This was to be under the auspices of Richard Wentworth, Esq., member of Parliament for Stafford, and was to set out in 1774, when the troubles incident to the Revolutionary war put a stop to the enterprise.

II. PERIOD OF TERRITORIAL EXPLORATION, 1783 TO 1858.

The war of the Revolution which left the east bank of the Mississippi in the possession of the United States and the west bank in the possession of the French, operated not only to terminate English and French exploration, but to retard that of the United States. It was not till after the cession of Louisiana by France that the United States government instituted measures for the exploration of the unknown country west of the Mississippi, when, in 1805, Captains Lewis and Clarke were dispatched to explore the Missouri river, and Lieutenant Z. M. Pike to ascend the Mississippi to its source. Lieut. Pike found the upper Mississippi country occupied by trading posts of the Northwest Fur Company, over which was still flying the English flag, a fact which attests the isolation of that region since the peace concluded in 1783. One of these posts was found at Red Cedar lake, (north of Mille Lacs) one at Sandy lake and two at Leech lake, whose influence extended "from the head of lake Superior to the source of the Mississippi and down Red river." This company had employed Mr. David Thompson as explorer and geographer for many years, and Lieut. Pike refers to his having established the latitude of Red Cedar lake (now Cass L.) supposed to be the source of the Mississippi, in 1798, finding this Post to be in latitude 47° 38′. Mr. Thompson's maps and papers never having been published. Lieut. Pike is to be accredited with the first authenticated examination of the Mississippi valley from the St. Francis river to Red Cedar lake.*

* An account of expeditions to the sources of the Mississippi, and through the western parts of Louisiana. * * * * Performed by order of the Government of the United States during the years 1805, 1806 and 1807, by Major Z. M. Pike. Philadelphia, 1810.

MORRISON DISCOVERS ITASCA LAKE IN 1804.

The country of the upper Mississippi was pretty well known to the *coureurs des bois* of the various fur companies probably, before the advent of Pike, but there is almost nothing preserved of all their explorations. Mr. William Morrison, however, has given in a brief letter to the Minnesota Historical Society* a statement of his own discovery of Elk lake (now called Itasca) in 1804, mentioning also Cross lake, (Pemidji lake), Red Cedar lake and Leech lake for the first time. He also states that he wintered at Rice lake, tributary to Rice river, a branch of the Red river of the North, in 1803–4. In order to reach it he made a portage from the Mississippi, a short distance below Elk lake, westward, known as the Portage of the Height of Land, or the dividing ridge that separates the waters of the Mississippi from those that empty into the Red river of the North.

LIEUT. Z. M. PIKE.

Reaching the falls of St. Anthony Lieut. Pike made a careful survey, and wrote a description of the portage route in his journal, and a brief description of the falls in a letter to General Wilkinson at St. Louis. He added nothing of value to the natural history and geography of the Mississippi valley below the falls of St. Anthony. With twenty soldiers he attempted to reach Leech lake, but by stress of weather and early snow was compelled to erect a winter stockade on the west side of the Mississippi a short distance below Pike rapids. Here having deposited the most of his baggage and supplies, he pushed forward in midwinter, with indefatigable energy and industry, with a foot-party, as far as Sandy lake. Thence he proceeded toward Leech lake (then denominated lake La Sang Sue) by way of the Willow river valley and Pokegama lake, where he arrived February 1st, 1806. A few days later, having visited the N. W. Co.'s station at Red Cedar lake and ascertained its latitude (47° 42′ 40″), where he found a hospitable Canadian named Roy, he set out on his return to his stockade, by a different route, traveling south-eastwardly by way of lakes to Whitefish lake, which he states may be considered the main source of Pine river, reaching the Mississippi at the mouth of a creek about nine miles above the mouth of Pine river. Making

*Minnesota Historical Collections, Volume I. p. 417.

a short visit to Mr. Grant's trading-post on "Red Cedar lake"* he left on the 28th of February on his descent to his stockade, where he stayed till the ice broke up in the spring, when he returned to St. Louis.

LIEUTENANT PIKE ON THE FALLS OF ST. ANTHONY.

In order to complete the history of the falls of St. Anthony from the time of their discovery to the final occupancy of the place by permanent settlements, with a view to ascertaining their rate of recession by means of the islands which have undergone changes from time to time, as noted by different visitors, Lieut. Pike's description is herewith given, as one of the most exact and reliable.

In the appendix to his journal is found a letter addressed to Gen. Wilkinson, dated "26th Sept. above the falls of St. Anthony" containing the following:

The place where the river falls over the rocks appears to be about fifteen feet perpendicular, the sheet being broken by one large island on the east and a small one on the west, the former commencing below the shoot, and extending 500 yards above; the river then falls through a continued bed of rocks, with a descent of at least 50 feet perpendicular in the course of half a mile—from thence to the St. Peters, a distance of eleven miles by water, there is almost one continued rapid, aggravated by the interruption of twelve small islands. The carrying place has two hills, one of 25 feet, the other of 12, with an elevation of 45°, and is about three-fourths of a mile in length. Above the shoot the river is of a considerable width, but below (at this time) I can easily cast a stone over it. The rapids, or suck, comes about a half a mile above the shoot, when the water becomes calm and deep. He adds that this is merely a *coup d' œuil*.

On page 51, of the same appendix, he gives further particulars concerning the falls, viz:

As I ascended the Mississippi the falls of St. Anthony did not strike me with that majestic appearance which I had been taught to expect from the description of former travelers. On an actual survey I find the portage to be 260 poles; but when the river is not very low, boats ascending may be put in 31 poles below, at a large cedar tree, which would reduce it to 229 poles. The hill over which the portage is made is 69 feet ascent, with an elevation at the point of debarkation of 45°. The fall of the water between the place of debarkation and reloading is 58 feet; the perpendicular fall of the shoot is 16½ feet. The width of the river above the shoot is 627 yards; below 209. For the form of the shoot see a rough draught herewith. In high water the appearance is much more sublime, as the great quantity of water *then* forms a spray which in clear weather reflects from some positions the colors of the rainbow, and when the sky is o'ercast, cover the falls in gloom and chaotic majesty.

LIEUT. PIKE ABOVE THE FALLS OF ST. ANTHONY.

From the falls of St. Anthony to Rum river, the Mississippi is almost one continued chain of rapids, with the eddies formed by winding channels. Both sides are prairie, and scarcely any timber but small groves of scrub oak. *Rum* river is about 50 yards wide at its mouth, and takes its source in Le Mille Lac, which is about thirty-five miles south of *Lower Red Cedar* lake. The small Indian canoes ascend this river quite to the lake, which is considered as one of the best

*This Red Cedar lake in other places is styled Lower Red Cedar lake, and is a few miles southwest of Aitkin.

fur-hunting grounds for some hundreds of miles, and has been long a scene of rencounters between the hunting parties of the Sioux and Sauteaux. The last winter a number of the Fols Avoins and Sioux, and some Sauteaux, wintered in that quarter. From *Rum* river to *Leaf* river, (called by Father Hennepin and Carver the river *St. Francis*, and was the extent of their travels) the prairies continue with a few interruptions. The timber, scrub oak, with now and then a lonely pine. Previous to your arrival at *Leaf* river you pass *Crow* river on the west, about 30 yards wide, which bears from the Mississippi S. W. *Leaf* river is only a small stream of not more than 15 yards over and bears N. by W.

The elk begin to be very plentiful; some buffalo, quantities of deer, raccoons, and on the prairie a few of the animals called by the French brelaws.

From thence to *Sac* river [Sauk river] a little above the Grand rapids, both sides of the river are generally prairie, with skirts of scrub oak. The navigation still obstructed with ripples, but with some intermissions of a few miles.

At the *Grand rapids* the river expands itself to about 3-4 mile in width (its general width being not over 3-5 mile) and tumbles over an unequal bed of rocks for about two miles, through which there cannot be said to be any channel; for notwithstanding the rapidity of the current, one of my invalids who was on the W. shore waded to the E. (where we were encamped.) The east bank of the rapids is a very high prairie, the west scrubby woodland. The Sac river is a considerable stream which comes in on the west, and bears S. W., and is 200 yards wide at its mouth.

The quantity of game still increasing from the Sac river to Pine creek, (the place where I built my stockade and left part of my party) the borders are prairie, with groves of pine on the edge of the bank; but there are some exceptions, where you meet with small bottoms of oak, ash, maple and lynn. In this distance there is an intermission of rapids for about 40 miles when they commence again and are full as difficult as ever. There are three small creeks emptying in on the west scarcely worthy of notice, and on the east are two small rivers, called *Lake* and *Clear* rivers.* The former quite a small one bears N. W. and is about 15 yards wide at its mouth; and about three miles from its entrance is a beautiful small lake, around which resort immense herds of elk and buffalo. *Clear* river is a beautiful little stream of about 80 yards in width, and heads in some swamps and small lakes on which the Sauteaux of *Lower Red Cedar* lake, and *Sandy* lake, frquently came to hunt. The soil of the prairies from above the falls is sandy, but would raise small grain in abundance; the bottoms rich and fit for corn or hemp. *Pine* creek† is a small stream which comes in on the west shore and bears nearly west. It is bounded by large groves of *white* and *red* pine. From *Pine* creek to the *Isle De Corbeau*, (or river of that name) two small rivers come in on the west shore. The first is of little consequence; but the second, called *Elk* river is entitled to more consideration from its communication with the river *St. Peters*. They first ascend it to a small lake, cross it, then ascend a small stream, [Long Prairie river] to a large lake, [Carlos lake] from which they make a portage of four miles west and fall into the *Sauteaux* river, [Little Chippewa] which they descend into the river *St. Peters*. On the east side is one small stream, (*Nunkesebe river*) which heads toward *Lower Red Cedar lake*, and is bounded by hills. The whole of this distance is remarkably difficult to navigate, being one continued succession of rapid shoals and falls; but there is one deserves to be more particularly noticed, viz: the place called by the French *Le shute de la Roche Peinture*, which is certainly the third obstacle in point of navigation which I met with in my whole route. The shore where there is not prairie is a continued succession of pine ridges. The entrance of the river *De Corbeau* is partly hid by the island of that name, and discharges its waters into the Mississippi above and below it; the lowest channel bearing from the Mississippi N. 65° W. This (in my opinion) should be termed the forks of the Mississippi, it being nearly of equal magnitude and heading not far from the same source; although taking a much more direct course to their junction. It may be observed on the chart, that from St. Louis to this place, the course of the river had been generally N. to the W. and that from here it bore N. E. This river affords the best and most approved communication with the *Red* river, and the navigation is as follows. You ascend the river *De Corbeau* 180‡ miles to the entrance of the river *Des Feuilles*, which comes from the N. W. This you ascend 180 miles also,

*Lake river is now called Little Rock creek, and Clear river is the Platte.
†Now called Swan river.
‡Pike's distances are generally too great.

then make a portage of half a mile into *Otter Tail* lake which is a principal source of *Red* river. The other branch of the river *De Corbeau* [Long Prairie R.] bears S. W. and approximates with the St. Peters. The whole of this river is rapid, and by no means affording so much water as the Mississippi. Their confluence is in lat. 45° 49′ 50″ N. In this division the elk, deer and buffalo were probably in greater quantities than in any other part of my whole voyage. From thence to Pine river the Mississippi continues to become narrower and has but few islands. In this distance I discovered but one rapid which the force of the frost had not entirely covered with ice. The shores in general presented a dreary prospect of high barren knobs covered with dead and fallen pine timber. To this there were some exceptions of ridges of yellow and pitch pine, also some small bottoms of lynn, elm, oak and ash. The adjacent country is (at least two-thirds) covered with small lakes, some of which are three miles in circumference. This renders the communication impassable in summer, except with small bark canoes. * * * The *Pine* river bears from the Mississippi north 30° east, although it empties in on that which has hitherto been termed the west shore. It is 80 yards wide at its mouth, and has an island immediately at the entrance. It communicates with the lake *La Sang Sue* by the following course of navigation: In one day's sail from the confluence you arrive at the first part of *Whitefish* lake, which is about six miles long and two wide. From thence you pursue the river about two miles, and come to the *Second Whitefish* lake, which is about three miles long and one wide; then you have the river three miles to the third lake, which is seven miles long and two in width (which I crossed on my return from the head of the Mississippi, on the —— of February, and is in 46° 32′ 32″ N. latitude). From thence you follow the river a quarter of a mile to the fourth lake, which is a circular one of about five miles in circumference. From thence you pursue the river one day's sail to a small lake; from thence two days' sail to a portage, which conveys you to another lake; from whence, by small portages from lake to lake, you make the voyage to *Leech* lake. The whole of this course lays through ridges of pines or swamps of pinenet, sap pine,* hemlock, &c., &c. From the river *De Corbeau* to this place the deer are very plenty, but we found no more buffalo or elk. From this spot to *Red Cedar* lake the pine ridges are interrupted by large bottoms of elm, ash, oak and maple, the soil of which would be very proper for cultivation. From the appearance of the ice (which was firm and equal) I conceive that there can be but one ripple in this distance. *Red Cedar* lake lays on the east side of the Mississippi, at the distance of 6 miles from it, and very near equally distant from the river *De Corbeau* and lake *De Sable*. Its form is an oblong square, and may be ten miles in circumference. From this to lake *De Sable*, on the E. shore, you meet with *Muddy* river,† which discharges itself into the Mississippi by a mouth twenty yards wide, and bears nearly N. E. We then meet with *Pike* river‡ on the west, about 77 [17?] miles below *Sandy* lake, and bears nearly due north, up which you ascend with canoes four days' sail and arrive at a wild-rice lake, which you pass through and enter a small stream, and ascend it two leagues; then cross a portage of two acres into a lake seven leagues in circumference; then two leagues of a river into another small lake. From thence you descend the current N. E. [N. W?] into *Leech* lake. The banks of the Mississippi are still bordered by the pines of the different species, except a few small bottoms of elm, lynn and maple. The game scarce, and the aborigines subsist almost entirely on the beaver, with a few moose and the wild rice or oats.

Sandy lake river (or the discharge of said lake) is large, but is only six miles in length from the lake to its confluence with the Mississippi. Lake *De Sable*§ is about 25 miles in circumference, and has a number of small rivers running into it; one of those is entitled to particular mention, viz., the river *Savanna*, which by portage of three miles and three-quarters, communicates with the river *St. Louis*, which empties into lake Superior at the *Fond du Lac*, and is the channel by which the N. W. Company bring all their goods for the trade of the upper Mississippi. Game is very scarce in this country. In ascending the Mississippi from *Sandy* lake, you first meet with *Swan* river on the east, which bears nearly due E. and is navigable for bark canoes ninety miles to *Swan* lake. You then meet with the *Meadow* river,‖ which falls in on the east, and bears nearly E. by N., and is navigable for canoes 100 miles. You then in ascending meet with a very strong ripple, and an expansion of the river, where it forms a lake. This is three miles below the falls of *Packegamau*, and from which the noise of the shoot might be heard. The course of the river at the falls was N. 70° W., and just below, the river is a quarter of a mile in width, but above the

*Tamarac and balsam fir; but hemlock does not occur. †Rice River. ‡Willow river. §Sandy lake. ‖Prairie river.

shoot not more than 20 yards. The water thus collected, runs down a flat rock which has an elevation of about 30 degrees. Immediately above the fall is a small island of about 50 yards in circumference, covered with sap-pine.* The portage, which is on the E. (or N.) side is no more than 200 yards, and by no means difficult. Those falls, in point of consideration as an impediment to navigation, stand next to the falls of St. Anthony, from the source of the river to the gulf of Mexico. The banks of the river, to the *Meadow* river, have generally either been timbered by pine, pinenett, hemlock, sap-pine, or the aspen tree. From thence it winds through high-grass meadows (or savannas), with the pine swamps at a distance appearing to cast a deeper gloom on the borders. From the falls in ascending you pass the lake Packegamau on the west, celebrated for its great production of wild rice; and next meet with the *Deer* river on the east, the extent of its navigation unknown. You next meet *Riviere Le Cross*, on the east side, which bears nearly north, and has only a portage of one mile to pass from it into the lake *Winipeque*† branch of the Mississippi. We next come to what the people of that quarter call the *Forks of the Mississippi*, the right fork of which bears N. W. and runs eight leagues to lake *Winnipeque*, which is of an oval form of about 36 miles in circumference. From lake *Winnipeque* the river continues 5 leagues to *Upper Red Cedar* lake‡, which may be termed the upper source of the Mississippi. The *Leech* lake branch bears (from the forks) S. W. and runs through a chain of *Meadows*. You pass *Muddy* lake, which is scarcely anything more than an extensive marsh of 15 miles in circumference; the river bears through it nearly N., after which it turns again W. In many places this branch is not more than ten or fifteen yards wide, although 15 or 20 feet deep. From this to *Leech* lake the communication is direct, and without any impediment. This is rather considered as the main source, although the *Winnipeque* branch is navigable the greatest distance. To this place the whole face of the country has the appearance of an impenetrable morass. or boundless savanna. But on the borders of the lake is some oak, and large groves of sugar maple, from which the traders make sufficient sugar for their consumption the whole year. *Leech* lake communicates with the river *De Corbeau* by seven portages, and the river *Des Feuilles* also, with the *Red* river by the *Otter Tail* lake on the one side, and by the *Red Cedar* lake and other small lakes to *Red* lake on the other. Out of these small lakes and ridges rise the upper waters of the *St. Lawrence*, *Mississippi*, and *Red* river,¿ the latter of which discharges itself into the ocean by lake *Winipie* and *Hudson's* Bay. All those waters have their upper sources within 100 miles of each other, which I think plainly proves this to be the most elevated part of the N. E. continent of America. But we must cross (what is commonly termed) the *Rocky Mountains*, or a spur of the *Cordeliers*, previous to our finding the waters whose currents run westward and pay tribute to the western ocean.

In this quarter we find moose, a very few deer and bear, but a vast variety of fur animals of all descriptions.

MAJOR S. H. LONG AT THE FALLS OF ST. ANTHONY.

In 1817 Major Stephen H. Long, of the United States Army, made a visit to the falls of St. Anthony,‖ and has made so correct a description of them that, by comparison with that of Pike, in 1805, such changes are seen to have taken place that some idea of their rate of recession can be gained.

The perpendicular fall of the water at the cataract, as stated by Pike in his journal, is 16½ feet, which I found to be true by actual measurement. To this height, however, four or five feet may be added for the rapid descent which immediately succeeds the perpendicular fall within a few yards below. Immediately at the cataract the river is divided into two parts by an island which extends considerably above and below the cataract, and is about 500 yards long.

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*Balsam Fir. †Winnibigoshish. ‡Cass Lake.

¿Pike has this footnote: Red river discharges itself into Hudson's Bay by lake Winipie and Nelson's river.

‖Minnesota Historical Collections, Vol. II.—Voyage in a six-oared skiff to the falls of St. Anthony in 1817, by Major Stephen H. Long, with an introductory note by Edward D. Neill.

The channel on the right side of the island is about three times the width of that on the left. The quantity of water passing through these is not, however, in the same proportion, as about one-third part of the whole passes through the left channel. In the broadest channel, just below the cataract, is a small island also, about fifty yards in length, and thirty in breadth. Both of these islands contain the same kind of rocky formation as the banks of the river, and are nearly as high. Besides these, there are immediately at the foot of the cataract, two islands of very inconsiderable size, situated in the right channel also. The rapids commence several hundred yards above the cataract, and continue about eight miles below. The fall of the water, beginning at the head of the rapids, and extending two hundred and sixty rods down the river to where the portage road commences, below the cataract, is, according to Pike, fifty-eight feet. If this estimate be correct the whole fall from the head to the foot of the rapids is not probably much less than one hundred feet. But as I had no instrument sufficiently accurate to level, where the view must necessarily be pretty extensive, I took no pains to ascertain the extent of the fall. The mode I adopted to ascertain the height of the cataract was to suspend a line and plummet from the table rock on the south side of the river which at the same time had very little water passing over it, as the river was unusually low. The rocky formations at this place were arranged in the following order from the surface downward: A coarse kind of limestone in thin strata containing considerable silex; a kind of soft friable stone of a greenish color and slaty fracture, probably containing lime, alumina and silex; a very beautiful stratification of shell limestone, in thin plates, extremely regular in its formation and containing a vast number of shells, all apparently of the same kind. This formation constitutes the table rock of the cataract. The next in order is a white or yellowish sandstone so easily crumbled that it deserves the name of sand-bank rather than that of a rock. It is of various depths, from ten to fifty or seventy-five feet, and is of the same character with that found at the caves before mentioned. The next in order is a soft, friable sandstone, of a greenish color, similar to that resting upon the shell limestone.* These stratifications occupy the whole space from the low-water mark nearly to the top of the bluffs. On the east, or rather north side of the river, at the falls are high grounds at the distance of half a mile from the river, considerably more elevated than the bluffs, and of a hilly aspect.

GOVERNOR LEWIS CASS' EXPEDITION TO THE UPPER MISSISSIPPI.

In 1820 Gov. Lewis Cass, of Detroit, conducted an exploring expedition from Detroit to the upper Mississippi region, coasting the shores of lakes Huron and Superior in canoes. From the head of lake Superior he followed the route, then much traveled, for canoes, by portaging, to Sandy lake and the upper Red Cedar lake, the latter of which was denominated Cass lake, by Mr. H. R. Schoolcraft, the chief narrator of the expedition.† This lake was considered by him, as by Lieut. Pike, the chief head of navigation of the Mississippi.

In passing the falls of Pokegama, Mr. Schoolcraft made the observation, that "the Mississippi at this point forces its way through a quartzy rock, during which it sinks its level, as estimated, twenty feet, in a distance of about three hundred yards. There is no perceptible cascade, or abrupt fall,

*Major Long here seems to have made an error similar to that of Keating at Fort Snelling, taking fallen fragments to be *in situ*.

†Summary narrative of an exploratory expedition to the sources of the Mississippi in 1820, resumed and completed by the discovery of its origin in Itasca lake in 1832, with appendixes. By Henry R. Schoolcraft.

but the river rushes with the utmost velocity down a highly inclined rocky bed toward the northeast." * * * * * "Immediately above the fall is a small rocky island bearing a growth of spruce and cedars."

Schoolcraft states that the Mississippi, instead of having its source in Cass lake, or even in Turtle lake, enters Cass lake from the south at a distance of eight or ten miles from the mouth of Turtle river.*

Mr. Schoolcraft's geological and mineralogical resumé of the expedition is quite full, but embraces much territory beyond the limits of Minnesota. He is the first to give a geological account of the lower valley of the St. Louis river, but his statements about its tributaries being from "the northwest of the Rainy lakes," and Vermilion lake tributary to its volume, while in keeping with a general looseness in his statements, show still a lack of geographical knowledge of that region. He estimates its descent from Knife falls, through the "Cabotian Mountains," at about 418 feet. He says that the red sandstone at Fond du Lac is succeeded, up the river further, by "trap, argillite and grauwacke." * * * "The river is continually in a foam for nine miles, and the wonder is that such a furious and heavy volume of water should not have prostrated everything before it. The sandstone, grauwacke, and the argillite, the latter of which stands on its edges, have opposed but a feeble barrier; but the trap species, resisting with the firmness, as it has the color, of cast-iron, stand in masses which threaten the life and safety of everything that may be hurled against them. I found a loose specimen of sulphuret of lead, and some common quartz, in place in the slate rock, a vein of chlorite slate, and a locality of coarse graphite, to reward my search."

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*Resulting from the expedition of Gov. Cass, were several scientific papers, which at the date of their publication were valuable additions to the natural history of the region, viz:

1. Results of observations for latitude and longitude during the expediton of 1820. By Capt. David B. Douglass.
2. Report on the copper mines of lake Superior. H. R. Schoolcraft.
3. Observations on the Mineralogy and Geology of the country embracing the sources of the Mississippi river and the Great Lake Basins. By Henry R. Schoolcraft.
4. Report in reply to a resolution of the U. S. Senate on the value and extent of the mineral lands on lake Superior. By Henry R. Schoolcraft.
5. Rapid glances at the Geology of Western New York, beyond the Rome summit, in 1820. By Henry R. Schoolcraft.
6. A memoir on the Geological position of a fossil tree in the secondary rocks of Illinois, 1822. By Henry R. Schoolcraft.
7. List of plants collected by Capt. D. B. Douglass, at the sources of the Mississippi river. From the 4th Volume of Silliman's Journal of Science. By Dr. John Torrey.
8. A letter embracing notices of the Zoology of the Northwest, addressed to Dr. Mitchell, on the return of the expedition. By Henry R Schoolcraft.
9. Species of Bivalves collected by Mr. Schoolcraft and Capt. Douglass in the Northwest. From the 6th Volume of the American Journal of Science. D. H. Barnes.
10. Fresh water shells collected by Mr. School raft in the valleys of the Fox and Wisconsin rivers. From the 5th Volume of the American Philosophical Transactions. By Isaac Lea.
11. Summary remarks respecting the Zoological species noticed in the expedition. By Dr. Samuel L. Mitchell.
12. *Mus busarius.* Medical Repository, Vol. 21. By Dr. Samuel L. Mitchell.
13. *Sciurus tridecem-striatus.* Medical Repository, Volume 21. By Dr. Samuel L Mitchell.
14. *Proteus* of the lakes. Am. Jour. Sci., Vol 4. Dr. Samuel L. Mitchell.
15. Memoranda on Climatic Phenomena and the Distribution of Solar Heat, in 1820. By Henry R. Schoolcraft.

SCHOOLCRAFT AT LITTLE FALLS AND SAUK RAPIDS.

In descending the Mississippi below the Pakagama, the first stratum of rock, which rises through the delta of the river, occurs between the mouth of the Nokasippi and Elm rivers below the influx of the Great De Corbeau. This rock, which is greenstone trap, rises conspicuously in the bed of the stream in a rocky isle seated in the rapid called—I know not with what propriety—the BIG FALLS or *Grand Chute*. The precipitous and angular falls of this striking object decide that the bed of the stream is at this point on the igneous, granitical and greenstone series. This formation is seen at a few points above the water, until we pass some bold and striking eminences of shining and highly crystalline hornblendic sienite, which rises in the elevation called by us Peace Rock, on the left bank near the Osaukis rapids. This rock lies directly opposite to the principal encampment on the 27th of July, which was on an elevated prairie on the west bank. To this point a delegation of Sioux had ascended on an embassy of peace from Fort Snelling to the Chippewas, having affixed on a pole what the exploring party called a bark letter, the ideas being represented symbolically by a species of picture writing or hieroglyphics. In allusion to this embassy, this locality was called the *Peace Rock*. This rock is sienite. It is highly crystalline, and extends several miles. Its position must be, from the best accounts, in north latitude 44° 30′. From this point to Rum river, a distance of seventy miles, no other point of the intrusion of this formation above the prairie soil was observed.

The rock at the falls of St. Anthony Mr. Schoolcraft regards as belonging "to the great carboniferous and metalliferous formations, which for so great a length, and in so striking a manner characterize both banks of the Mississippi below St. Anthony falls." The white sandstone at the falls is said to be overlain by the "metalliferous limestone." The grains of sandrock are held together by "the cohesion of aggregation," and embrace, sparingly, "orbicular masses of hornblende." The overlying limestone is the "same in character, which assumes at some points a siliceous, and at others a magnesian character. It is manifestly the same great metalliferous rock which accompanies the lead ore of Missouri and mines of Peosta or Dubuque." Referring to Chimney and Castle rocks, in Dakota county, Mr. Schoolcraft thinks they are the result of degradation and wasting away, on the Huttonian theory, of all but these, probably harder, portions of the strata.

KEATING'S NARRATIVE OF MAJOR LONG'S EXPEDITION IN 1823, TO THE SOURCE OF THE ST. PETER RIVER.

Major S. H. Long, who had, in 1817, visited the falls of St. Anthony, was directed by the United States Secretary of War, in 1823, to conduct a party of exploration to the source of the St. Peter river, and to lake Winnipeg. He was accompanied by a number of scientific gentlemen of Philadelphia, including Prof. William Keating of the University of Pennsylvania, who embodied the notes and manuscripts of the various members of the party,

in a work of two volumes, published in 1825, in London. The appendix embraces a general list of animal species observed by Thomas Say, and a list of plants by Lewis D. de Schweinitz, also astronomical and meteorological data by J. Edward Colhoun and Dr. Joseph Lovell, concluding with a vocabulary of Indian words by Mr. Keating.*

This work may be correctly pronounced the first attempt to apply the accurate methods of modern science to the exploration of any portion of Minnesota. Although the progress of the party was much too rapid for geological examinations, yet the collections made, the notes on geographical features recorded, and the few geological facts stated, constitute a good preliminary account of the western portions of the state. The party returned to lake Superior from lake Winnipeg, by way of a route through British territory to the lake of the Woods; thence following the northern boundary line to the west end of Hunter's island, they again turned northward, and reached lake Superior at Fort William, by way of the route of Sir Alexander McKenzie. The map accompanying the report is an embodiment of information from several sources, besides the observations of the party, chiefly the report of Lieut. Pike on the upper Mississippi, Buchett's map of Upper and Lower Canada, statements by officers of the Hudson's Bay Company, and by Dr. J. J. Bigsby, of the English Commission for determining the boundary between the United States and the British possessions. On this map are given for the first time the names and positions of numerous streams in the western part of Minnesota, and in eastern Dakota, and of some flowing north in the northern part of the state.

KEATING'S VISIT TO THE FALLS OF ST. ANTHONY.

On the 6th of July we walked† to the falls of St. Anthony, which are situated nine miles along the course of the river, seven by land) above the fort. The first glimpse which we caught of the fall was productive of disappointment, because it yielded but a partial view; but this was amply redeemed by the prospect which we obtained of it when the whole fall opened itself before us. We then discovered that nothing could be more picturesque than this cascade. We had been told that it appeared like a mere mill-dam, and we were apprehensive lest a fall of sixteen feet would lose all its beauty when extended upon a breadth of several hundred yards, but we soon observed that this was by no means the case. The irregular outline of the fall, by dividing its breadth, gives a more impressive character. An island stretching in the river, both above and below the fall, separates it into two unequal parts, the eastern being two hundred and thirty yards wide, and the western three hundred and ten. The island itself is about one hundred yards wide. From

*Narrative of an Expedition to the Source of the St. Peter's river, lake Winnepeek, lake of the Woods, &c., performed in the year 1823, under command of Stephen H. Long. Compiled by Wm. H. Keating. In two volumes. London, 1825.

†From Fort Snelling.

the nature of the rock, which breaks into angular, and apparently rhomboidal fragments of a huge size, this fall is subdivided into several cascades, which adhere to each other, so as to form a sheet of water, unrent, but composed of an alternation of retiring and salient angles, and presenting a great variety of shapes and shades; each of these forms in itself a perfect cascade; but when taken together in one comprehensive view, they assume a beauty of which we could have scarcely deemed them susceptible. We have seen many falls, but few which present a wilder and more picturesque aspect than those of St. Anthony.*

Prof. Keating gives the following section of the bluff at Fort Snelling, in descending order:

1. Limestone, of a distinct slaty structure; compact, but with a splintery uneven fracture; filled with organic remains (*Producti*); of a light grayish-yellow color; 8 ft.

2. Limestone, of a blue color, destitute of fossils; an excellent stone for building, and good for quicklime. 15—20 ft.

3. Sandstone, constituting the principal mass of the bluff. This is friable, but every fragment, examined with care, seems *to be a regular crystal*. Keating inclines to the opinion that it must have been from a chemical precipitation, and not from mere mechanical deposition. The process of its formation may have been a very rapid one, such as is obtained in the manufacture of fine salt; and to this may be attributed the circumstance of its fine texture. The color is white—sometimes a little grayish, when it resembles the finer varieties of Muscovado sugar. 60 ft.

4. Limestone; slaty, striped with curved zones; very argillaceous, softer than the preceding; structure quite earthy; color light yellow. 10 ft.

5. Limestone; bluish, or yellowish gray, conglomeritic with small black pebbles of quartz; more crystalline than the last; vesicular; rises four feet above the level of the river. 7 ft.

6. Limestone; much finer grained and more earthy than the last. The bed of the river near the fort is excavated in this limestone.† 4 ft.

He remarks that at the falls of St. Anthony the same section may be een, except that the lower limestones are not there visible. The foregoing limestones, stated to lie below the sandstone at Fort Snelling, must have been large fallen fragments from the top of the bluff, since no subsequent observer has ever reported them. Mr. Featherstonhaugh makes the same correction.

KEATING ON THE MINNESOTA RIVER.

At the Indian village of Taoapa, estimated at thirty-seven and one-half miles from Fort Snelling, probably the same place as Shakopee, Major Long observed limestone which appeared to him to be *in situ*.

Keating mentions the rapids at Carver, "caused by two bars of sandstone," the first forming a fall of four feet in twenty yards. Half a mile above this is a second bar. The aggregate fall is estimated to be seven feet. This sandstone is seen in the bank, and "resembles that at Fort Snelling. It

*Major Long's party forded the river above the falls, walking on the rock from the west to the east side. Prof. Keating, who was debilitated by a fever, succeeded in reaching only the island dividing the fall, and with great difficulty returned to the west bank.

†Compare *Bulletins of the Minnesota Academy of Natural Sciences, Vol.* 1, *p.* 91.

has a fine crystalline grain and a color varying from white to yellow."* Apparently not observing that this sandstone rises gradually higher in ascending the valley, he refers to several "hills" located near the river, one of which, "composed principally of loose sand," was estimated at about one hundred and fifty feet in hight. At Camp Crescent (old *Travers des Sioux*), Major Long's party abandoned the canoes and followed the trail to Redstone, thus cutting off the great bend where the Blue Earth river enters the Minnesota, and losing the opportunity of examining the copper mine of Le Sueur.

Up to the point of abandoning the canoes the banks of the Minnesota are stated to be composed chiefly if not altogether of sandstone. On the last day of travel in the canoes, a bluff was seen rising sixty to eighty feet, consisting of white sandstone, and called White Rock, probably near Ottawa. He also observed at a distance horizontal ledges of rock that he considered "the limestone that lies on the sandstone." This point was probably at or near Kasota. The only streams that are regarded worthy of mention up to Camp Crescent, are the Elk, entering on the right bank, said to be about twenty miles above the fort, now called Credit river, and "the small rivulet which comes in from the left bank about forty miles above the fort, and which is probably the same as Carver's river." The forest was found to consist chiefly of maple, white walnut, hickory, oak, elm, ash and linden, interspersed with grapevines, &c., and the absence of black walnut was particularly observed.

The party seem not to have passed near enough to the red quartzyte outcrop near New Ulm to have noticed it, since Keating makes no mention of it. The Blue Earth is said to take its rise "in the Coteau des Prairies, a highland that stretches in a northerly direction between the Missouri and the St. Peter." This is the first mention of this natural phenomenon under that name.

BOULDERS OF PRIMITIVE ROCK IN THE MINNESOTA VALLEY.

In reference to the granite and gneiss of the valley Keating makes the following observation:

*The sandstone here mentioned by Keating is the Jordan sandstone lying below the Shakopee limestone.

1823, Keating]

A feature which struck us was the abundance of fragments of primitive rocks which are strewn in this valley; they were for the most part deeply imbedded in the ground, and bore but few traces of attrition; their bulk was very large. For a while we doubted whether we were not treading upon a crust of a formation of primitive rocks, which pierced through the superincumbent formations; but a close observation evinced such a confusion and diversity in the nature of the primitive blocks, as well as such signs of friction, as satisfied us that these were out of place; still they appeared to warrant the geologist in his prediction, that the party was approaching to a primitive formation, and that certainly the valley of the St. Peter had been one of the channels through which the primitive boulders had been removed from their original site. This assertion was fully substantiated two days afterward by the discovery of the primitive rocks *in situ*. A very considerable swell between the river and the right bank of the valley was supposed to be formed by the primitive rocks rising to a greater level than usual. If it be occasioned by an accumulation of fragments and boulders, as the nature of its surface might lead to believe, it is a very interesting feature in the valley.

In traveling up the valley of the Minnesota river, on the south side, various interesting observations were recorded, respecting the fauna and flora of the prairies, from which is the following extract:

Among the birds observed on the prairie, besides the sand-hill crane, are the red-bird, black-bird, yellow-headed black-bird, the black-breasted tern, the last of which was very abundant. Mr. Say shot the female of the Mergus cucullatus and a blue-winged teal. Among the reptiles, besides the common garter-snake, there was one with lateral red spots. A coluber like the melanoleucus, but spotted, and similar to that found on the Missouri, was killed on these prairies. In several of the marshes the huts of the muskrat were found very abundant. The herbarium was enriched by the addition of a beautiful specimen of the Lilium Philadelphicum, which was still seen flowering, though it had nearly ceased to bloom. Another great ornament of the prairies is the Lilium superbum. The Gerardia was still occasionally seen. This plant is, as we were informed, considered by the Indians to be a specific against the bite of a rattlesnake; the root is scraped and the scrapings applied to the wound; it is said that, if used upon a recent wound, a single application will suffice. The boulders which are so common in the valley of the St. Peter, are but seldom seen on the prairies.

No further geological notes are made till reaching the Redwood river, when he makes the statement that its banks "are formed of a fine white sandstone." It is probable that he mistook at a distance, the white kaolin bluffs which occur at that point, derived from the decomposition of the granite *in situ*, for sandstone. There is a little sand in the Cretaceous at that point, but there are no bluffs of white sand. The red pipestone was said to exist on its banks at three days' journey from its source.

No primitive rock *in situ* was noted, although it occurs at frequent intervals between New Ulm and Big Stone lake, till he reached a point several miles above Patterson's rapids. He notes "a very interesting fragment of rock" at the place where the Redwood joins the Minnesota, said to be forty or fifty feet in circumference, evidently out of place, of an enormous mass, and irregular hemispherical form, cleft by lightning. This mass was said to be granitic, presenting "very distinctly the appearance of a formation of

concentric shales." The rock at Patterson's rapids was considered as primitive, but was not carefully examined.

GRANITE IN THE MINNESOTA VALLEY.

On the afternoon of the 18th of July, Major Long's party first met with unmistakable primitive rock *in situ*, at a point a few miles below the mouth of the Yellow Medicine river. Of this Keating remarks:

When descending into the valley from the prairie, with a view to select a suitable spot for our evening's camp, our attention was suddenly called to the new features which it displayed. High rocks of a rugged aspect arose in an insulated manner in the midst of the widened valley through which the St. Peter winds its way. We spent the rest of the afternoon in examining them, and experienced no little satisfaction in finding them to be primitive rocks *in situ*.

The pleasure we experienced sprang not from the mere associations of home, connected with the view of a primitive formation which we had not seen since the first five days of our journey; but it resulted also, in a great measure, from the certainty that we had at last arrived at what we had long been looking for in vain. We had traced those scattered boulders which lay insulated in the prairies from the banks of the Muskingum to this place; we had seen them gradually increasing in size and number, and presenting fewer signs of attrition as we advanced further on our journey. Two days before, their number, size and features had induced the geologist of the party to predict our speedy approach to the primitive formations, and it was a pleasing confirmation of his opinions to find these rocks really *in situ*, within thirty miles, in a straight line, of the place where he had made this assertion. The character of these rocks was examined with care, and found very curious. It seemed as if four simple minerals, quartz, fieldspar, mica and amphibole, had united here to produce almost all the varieties of combination which can arise from the association of two or more of these minerals; and these combinations were in such immediate contact that the same fragment might, as we viewed one or the other end of it, be referred to different rocks; while, in some places, granite was seen perfectly well characterized, varying from the fine to the coarse grained; in others a gneiss, mica slate, greisen (quarts and mica) compact feldspar (weisstein of Werner), sienite, greenstone, and the sienite with the addition of quartz forming the amphibolic granite of D'Aubuisson, were equally well characterized. The only rock composed by the union of two of these principles which we did not observe, but which may perhaps exist there, is the graphic granite (pegmatite, Hauy). These rocks are not very extensive; the circumference of the largest probably does not exceed one-quarter of a mile; they rise to about thirty-five feet above the level of the water. Their form is irregular; their aspect rugged and barren compared with the fertile bottom of the valley; their general color is of a dark gray; they appear to be the summit or crest of primitive rocks which lie beneath this valley, and which protrude at this place through the superior strata. As the adjoining prairies are elevated about fifty feet above the level of the river, these primitive rocks are observable only in the valley; they doubtless constituted at one time a continuous ridge, but have been divided into insulated masses by the corroding action of the stream, whose very circuitous bed winds between them. They extend upon a distance of about six miles in the direction of the valley. After having examined almost every one of these masses, I feel unwilling to decide, with certainty, which of the primitive combinations predominates, for the passage of the one into the other is more constant and more sudden than in any other primitive formation that has ever come under our notice. Indeed we know of none with which to compare it, except it be that which we observed at a subsequent period of the expedition between lake Winnipeek and the lake of the Woods; but even there the features were somewhat different, for they were on a larger scale. The passages which we there observed were sometimes to be traced only upon large masses; whereas on the St. Peter it would have been difficult to break off a fragment of a cubic foot in size presenting an uniform character of composition. It is however probable, as far as our observations extended, that granite is the predominating rock. These masses bear very evident signs of a crystalline origin, but the process

1823, Keating.]

must have been a confused one. Tourmaline is found disseminated throughout the rock, yet in no great abundance. In one or two spots where the mass assumed a more slaty appearance than in other places a faint tendency to a stratification, directed from the north-northeast to the south-southwest, with a dip toward the south, was observed. Viewing the insulated masses from the prairie, they appeared to be directed in a transverse line through the valley, and in a northeasterly course, so that this may be the remains of a dike which existed across the valley, but which was finally broken. This observation was, however, a partial one, and it would be improper to attach much weight to it. When calling the attention of our guide to the difference between these rocks and those observed below. he appeared to have been aware of it himself, and stated that rock similar to these extended down the valley to about four miles below Redwood rivulet. It was partly from this circumstance that we inferred that Patterson's rapids were probably formed by a bar of these rocks rising across the bed of the river. This appeared to us to be the more probable from the circumstance that a rapid known by the name of the Little falls, occurs just above the place of our encampment of the 18th, and that it is occasioned by a ledge of granite rocks over which the river passes at this place. In the examination of this spot two points appeared to us chiefly to deserve our attention, in order to avoid all source of error; the first was to ascertain that the rocks were really *in situ*; the second, that they were primitive and crystalline, not conglomerated or regenerated rocks, such as are sometimes observed. But upon these two points we think that not the least doubt can be entertained. The immense mass of these insulated rocks, the uniform hight to which they attain, the uniform direction in which they lie, prove them to be in place; while an attentive inspection of their nature shows them to be really crystalline. There is a gradual, though rapid, passage of the granite into the sienite, which proves them to be of contemporaneous formation, and which precludes the idea that the rock is formed by the union of fragments of granite, sienite, &c., cemented together.

The discovery of this granitic formation here appeared the more interesting, as its small extent might easily have prevented us from observing it, had not chance brought us to the river at this place; for if we had been traveling on the prairie, within half a mile of the edge of the bank, the greater hight of the bluff would have concealed these rocky islands from our view. We feel, therefore, unable to decide whether they do not occur at some other bends of the river which we avoided; yet from the character of the stream itself we doubt it. For we find that as soon as these rocks protrude into the valley, they occasion rapids and falls in the river, while otherwise its course is smooth. Had we not seen the "Little rapids", which we passed on the 11th, we might have been induced to consider them as resulting from the appearance of the primitive rocks at the surface, but having examined with care the sandstone rocks, by which they are produced, and having ascertained that no other rapids are found in the St. Peter, between these and the Patterson falls, we are induced to believe that this is the only place where granite may be seen *in situ*. In attempting to connect this primitive formation with those observed elsewhere, we find that it lies in a direction about W. S. W., at a distance probably not exceeding eighty miles, of the "granitic and hornblendic rocks" which Mr. Schoolcraft states as having seen "occasionally rising in rugged peaks and beds" on the Mississippi.* We feel, however, disposed to consider all this section of our country as reposing on this granite, and we entertain but little doubt of its identity with the sienitic granite observed at a later period of our journey, and which we first struck near fort Alexander at the mouth of the Winnipeek river.

Subsequently Mr. Keating observed that these rocks, which were made out to be in latitude 44° 41′ 26″ N., did not extend far in the valley. The last of them were seen at about four miles above the little falls, and he was assured by the guide that they did not recur for a considerable distance. Still he observed, at a distance, a rocky island in the bed of the river, which had the same kind of rock as that at Patterson's rapids; and again at points further up the valley rocky knolls were observed.

*Schoolcraft's Narrative, p. 288.

The recurrence of these primitive knobs disturbs the current of the river, and renders the navigation difficult and hazardous. Five miles below the encampment of the 19th there is a place where the boats and their loads are carried for the distance of a mile; from which circumstance the place is called the Grand Portage. By this portage the canoes avoid thirteen rapids; these, with twenty-six other rapids, constitute all the obstructions to the navigation of the river from its source to its mouth. In a good stage of the waters, there are, however, but two portages, of which this is one. Among the tributaries passed that day only one deserves to be mentioned. It is called the Pejehata Zeze Watapan (*yellow medicine*) It is about the same size as the Redwood, and rises, in like manner, at the base of the Coteau des prairies. Nearly opposite to it a small stream falls in; the Indians call it the Chataba (*that hatches sparrow-hawks*); the traders term it *L'Eau de Vie*. On our map we have retained the name Epervier, which being in use among some of the traders, and intelligible both to French and English travelers, appears likely to prevail.

The foregoing exposures were wholly below Lac qui Parle, which is said to be a short day's journey further up, consisting of an expansion of the river, similar to lake Pepin, about seven and a half miles long, and from one-quarter to three-quarters of a mile wide. Mention is made of the Chippewa river, coming in from the north, said to interlock with the headwaters of the Red river, also of "Beaver rivulet" (Lac qui Parle river) which, with steep and high banks consisting of loose, white sand, joins the St. Peter near the foot of Lac qui parle. Of the country about Lac qui parle Keating notes that the elevation evidently became greater as they advanced, but with no hills of any magnitude, the only ascents being the river bluffs, which sometimes reach or exceed one hundred feet. The surrounding undulated plains were destitute of wood, the only trees seen skirting along the water-courses. Above the lake the bluffs are said to diminish in hight, not being more than forty feet, the high prairie sometimes blending gradually with the river valley. Above the lake the St. Peter was found to be only a rivulet from twenty to thirty feet wide, very much obstructed with high grass and wild rice, and stagnant water. Five leagues higher the Spirit Mountain* creek joins the St. Peter from the south, so named from a hill near which it is said to rise. Near the mouth of this stream the primitive rock is again noted scattered here and there across the valley, one exposure in particular being remarkable for the beauty of its feldspar, which is described as "very lamellar, with an easy cleavage, and intermixed with quartz, giving it almost the appearance of graphic granite." Big Stone lake is described as the "last expansion of the river, improperly called a lake."

*Yellow Bank river.

1823, Keating.]

THE COTEAU DES PRAIRIES.

Although the party did not visit the Coteau des Prairies, Prof. Keating makes some interesting notes on its character and direction, which may be summarized briefly thus: Its hight above the St. Peter, at Big Stone lake, is thought to be not short of 1,000 feet. According to the best information he could obtain, "this ridge commences about the 49th parallel of north latitude, and between the 98th and 99th degrees of west longitude from Greenwich. It proceeds in a direction nearly south south-east, passes east of the group of small lakes called Devil's lake, divides the tributaries of the St. Peter from those of the Missouri, and extends southerly as far as the head of the Blue Earth, where it gradually widens and sinks to the level of the surrounding country." He mentions a second ridge or coteau, commencing at the southern bend of Mouse river, running in a direction nearly parallel with that of the other, from near the 48th parallel to beyond the 44th parallel, in a southeasterly course for about eighty miles, when it turns to the west of south and likewise sinks and disappears, the valley of the James river being between the two ridges. Mr. Keating was informed that no rocks can be seen composing the Coteau, but that it presents a uniformly smooth, prairie-like appearance, the ascent being gradual aud easy on both sides. He however was of the opinion that it is formed by an elevation of the granite rocks above their usual level, although, perhaps, covered as with a mantle by the secondary and alluvial rocks, predicting that if its whole course were to be followed "from the Assiniboine to the Blue Earth" the geologist would be rewarded by the discovery of the "granite formations, if not along the whole of its crest, at least in some of the ravines which head near it." Above Big Stone lake the St. Peter is said to divide itself into two branches, coming from the west, heading in the Coteau, one of which comes from west by south for abont twelve miles. The northern, and larger branch, has its source in Polecat lake, about twenty-four miles distant, west by north, from the point where they join Big Stone lake. That lake is one and a half miles long, and half a mile wide, and frequently dry. There are many indications in the narrative that this hasty reconnoissance of the Minnesota valley was not satisfactory to Prof. Keating.

In the Red River valley Keating mentions numerous salt springs, one being situated at the confluence of Red Lake river with the Red river of the North; states that although the soil of the prairies is occasionally sandy, it is generally argillaceous and rather dry, yielding along the river valley and its tributaries a good grass, though at a distance a rather scanty growth, but being extremely fertile wherever trees were seen to be growing; and attributes to the annual fires that run over the prairies the principal agency in keeping the country treeless.

ON THE NORTHERN BOUNDARY.

Respecting the northern boundary of Minnesota, Prof. Keating gives the first geological information, besides naming for the first time several of the principal rivers in that part of the state. Ascending the Winnipeg river from lake Winnipeg he found a great contrast between the adjacent country and that through which he had been traveling hitherto. The country is rocky very soon after leaving lake Winnipeg, with the crystalline rocks common to the northern part of Minnesota, there being between lake Winnipeg and the lake of the Woods several alternations from red granite and gneiss to slate and schists. The timber which sets in with this change in the character of the rocks, consists of a great abundance of evergreens, deciduous trees being rather the exception. The conifers were found to be tamarack, juniper, spruce, white pine, pitch pine &c., interspersed with spots where aspen and birch were found common, and other spots of hazel, willow and cherry. The rocks and the general characters of the country at the lake of the Woods were stated to be similar to those of the Winnipeg river. The lake is filled with islands, all resting on the solid rock which was found to be generally a greenish or micaceous slate. One island, known as Red Rock island,* was of a reddish granite. The direction of the "strata" of the mica slate was stated to vary from N. 60° to N. 80° E. and the angle of inclination to vary from 65° or 70° to perpendicular; but it is quite probable that Keating here refers to the direction and dip of the slaty cleavage. Although no limestone *in situ* is reported by Keating, he refers to the fact that Dr. Bigsby, whom he met on the British Northern Boundary Com-

*Subsequently named Keating Island by Mr. G. M. Dawson.

mission, states that it exists on the shore of the lake.* In Rainy-lake river he mentions two places only, where canoes are lightened and towed up, the current of this river being generally steady and of greater depth. The face of the country also changed very perceptibly, becoming more cheerful, and the grass "of a livelier green." At its mouth the banks of the stream are low and marshy; beyond this eastward they rise somewhat, but do not become hilly; the river having often a pebbly bed, leading to an anticipation of limestone rocks *in situ*. The rocks, however, seldom appeared in place along the river, and when seen consisted of mica slate and syenite; the slate containing, according to Dr. Bigsby, the mineral staurotide.† The fall at Rainy Lake fort is surpassed by two or three only of those on Winnipeg river. "The whole of the waters of the lake discharge themselves into the river by these falls, the hight of which is about twenty-five feet. The beauty of the spot depends much on the wildness of the rocky scenery, occasioning a foaming or dashing of waves that are very striking. The rock is chiefly sienite, in which we thought we could distinguish a tendency to a stratification directed about northeast and inclining about 65° to the southeast. This, however, may have been a local feature. The principal growth about the lake is the pitch pine, white pine and spruce. The soil is rather light, but in the immediate vicinity of the fort it is excellent; potatoes and wheat are cultivated, together with maize, pease, pumpkins, beans, water and musk melons, &c., &c. The wild strawberry seemed to be more abundant there than elsewhere. Our soldiers were kept busy, while encamped at the fort, in fishing for the pike and freshwater salmon, which are found in great abundance and excellence at the falls." Throughout Rainy lake are many small islands, which, according to Keating, are based on a rock which for the most part is a mica-slate, with strata directed north 70° east, and nearly vertical; but in a few places may be seen granite and syenite, the lake thus resembling in most of its characters the physical features of the lake of the Woods. East of Rainy lake the party pursued the boundary line canoe-route as far as the east end of Sturgeon island and there diverged northward, reaching Fort William through a region of successive lakes, and a rocky country, descending what was known as Dog river, but now as Kamanistigoia.

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*Dr. J. J. Bigsby reports limestone *in situ* on the shores of the southwest part of the lake, "some miles off in a low country, and buried beneath mounds of quartzose, sand, clay, and immense assemblages of blocks from the north."

† See Bigsby's *List of minerals and organic remains*, in Am. Jour. Sci. (1) VIII, p. 60, and *Jour. Geol. Soc.* London, Vol. VIII, p. 405.

MAJOR LONG'S RESUME OF THE EXPEDITION.

In a general topographical report of the expedition Major Long mentions the chief physical features of the country traversed, repeating many of the facts given by Keating in his journal. The Coteau des Prairies, he says, is a very remarkable feature in the aspect of the country about the headwaters of the Minnesota river. He regards it not only as the dividing ridge between the Mississippi and the Missouri rivers, but as a "grand dike," obstructing the latter in its progress eastward. Its elevation he gives at one thousand feet above the common level of the country. He mentions a second ridge west of the main one, with the James river between them, the two being thirty or forty miles apart. Of the Red river he says it is navigable for canoes, and even for pirogues of two tons burden, from its mouth to its source, as also to the sources of several of its tributaries when swollen by freshets. "On such occasions canoes have been known to pass from lake Travers, its source, into the St. Peter, and back again, without inconvenience." He estimates the descent from lake Traverse to lake Winnipeg at 200 feet, and that from the lake of the Woods at 400 feet. Lake Winnipeg he places at 630 feet above the ocean, Rainy lake 1100 feet, and lake of the Woods at 1040 feet, and the general elevation of the country containing the sources of the streams tributary to lakes Superior and Winnipeg, and to the Mississippi river, at 1200 feet.

BELTRAMI DISCOVERS THE JULIAN SOURCES OF THE MISSISSIPPI.

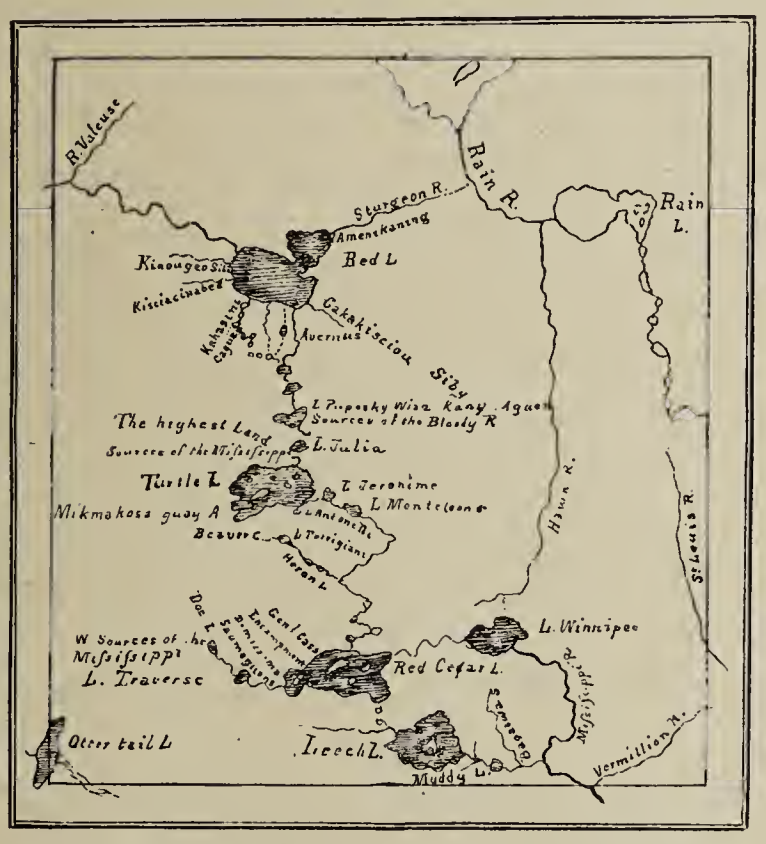
In Major Long's party for the exploration of the St. Peter's river, was an educated Italian gentleman, a political exile, of a romantic and sentimental cast of mind, named J. C. Beltrami, who, having joined the expedition at Fort Snelling, accompanied it as far as "Pembinar," where, considering himself rather discourteously treated by Major Long, and wishing to signalize his visit to the Northwest by some noteworthy discovery on his own account, he parted from Major Long and reached the upper Mississippi at Red Cedar lake, by way of Bloody river,* Red lake, and Turtle lake, and descended it as far as New Orleans, where he published his notes in French,† at a date

*Now the Red Lake river.

† La Decouverte des Sources du Mississippi et de la riviere Sanglante. One volume 8vo. 328 p., New Orleans, 1824

considerably earlier than the appearance of any of the official papers of Major Long, and several years earlier than Keating's "Narrative." It was subsequently enlarged and reprinted in London in English.* Although his "letters," constituting as they do a gossipy and literary curiosity in the field of exploration, may be justly styled a romance in the discovery of the upper Mississippi, and although they are characterized by numerous errors, both historical and geographical, as well as ethnological and zoological, they still give some additional information respecting the geography of the upper Mississippi and Red lake. The Minnesota legislature having set aside a large tract, under the name of Beltrami county, covering the Julian sources of the Mississippi, it is to be hoped that the names applied by Mr. Beltrami to the lakes and streams he visited may be preserved in the future settlement of the region, which, however, is still nearly as wild and uninhabited as when Mr. Beltrami passed through it.

FIGURE 4.



BELTRAMI'S MAP OF THE JULIAN SOURCES.
[Fac-simile.]

The above fac-simile of that portion of Beltrami's map embracing the region of the *Julian sources of the Mississippi*, coincides with his statement

*A Pilgrimage in Europe and America, leading to the discovery of the sources of the Mississippi and Bloody river with a description of the whole course of the former, and of the Ohio, by J. C. Beltrami, Esq., formerly Judge of a royal court in the Ex-Kingdom of Italy, London. 1828, 2 vols., 8vo. pp. 1093.

that he traveled almost due south from Red lake to Red Cedar lake. But in fact Red Cedar lake is considerably to the eastward of Red lake, and his course of travel was necessarily about southeast. The river which he first struck in traveling from "Pembinar" was the Thief river. His map names it Valeuse, and his book Robbers' river. His Indian guides found here their canoe which they had secreted for a murderous foray on the Sioux the previous week. Before reaching Red lake he was attacked by the Sioux, and one of his Chippewas was wounded in the arm. This caused them to desert him and pursue the route by land to Red lake. Then he started alone to drag the canoe containing his baggage to the lake by a cord, being unable to paddle it in the manner of the Indian. Meeting a party of Indians descending the "Bloody" river, he prevailed on one of their number to conduct him to the lake. Employing there a *bois brulé*, he ascended the stream that led him to Turtle lake, first making a long portage, to avoid an extensive wind-fall which had thrown many large forest trees across the stream. To the southwest of Red lake he visited and named a series of eight small lakes, which all communicate with each other, of which Gravel river (Kahasinilague) is the outlet into Red lake. These he named Alexander, Lavinius, Everard, Frederica, Adela, Magdalena, Virginia and Eleonora, names of a family to which he was "united by the most cordial friendship." On the western side the lake receives the river Broachus (Kinongeo) and that of the Great Rock (Kisciacinabed). The next, on the south shore, are the Gravel river and the Gold Fish river (Kiogokague), also the Great Portage (Madaoanakan). On the southeast is the Cormorant river (Cacakiscin). The northern portion of Red lake receives the Sturgeon river (Amenikanions) which communicates by means of two portages, with lake Superior and the waters of Hudson's bay. He regarded the Great Portage river as the real continuation of the Bloody river and cites the opinion of the Indians to that effect. "According to the theory of ancient geographers the sources of a river which are most in a line with its mouth should be considered as its principal sources, and particularly when they issue from a cardinal point and flow to one directly opposite." For the purpose of ascending this river he was compelled to make a portage of twelve miles, beginning on the lake between it and Gold Fish river. A small lake, about half way on this portage, he styled Avernus, and another near the end of the portage he

named lake of the Pines, "from the immense number of those trees with which it is surrounded." Its outlet is into the series of eight lakes that are discharged by Gravel river. From this lake he made another portage of four miles and reached the Grand Portage river. Ascending this river he passed two lakes which he denominated *Manomeny-Kany-aguen*, or Wild Rice lakes. These were formed by the enlargement of the waters of the river. The third lake, formed in the same way, the Indians called *Puposky-wiza-Kany-aguen*, or *end of the shaking lands*, nearly all the region traversed from the lake of the Pines, being so low and nearly level as almost to float upon the water. About six miles further south the real source of the Bloody river was found. It "springs out of the ground in the middle of a small prairie, and the little basin into which it bubbles up is surrounded by rushes. We approached the spot within fifty paces in our canoe."

LAKE JULIA.

Making a short portage from this spring, over a hill, Mr. Beltrami approached a wonderful lake. It is situated on a hill, with no higher land about it, in "the whole extent of the clearest and widest horizon." Mr. Beltrami's florid description is in these words: "All places around it are, on the contrary, considerably lower. I have made long excursions in all its environs, and have been unable to perceive any volcanic traces, of which its banks are equally destitute. Yet its waters boil up in the middle; and all my sounding lines have been insufficient to ascertain their depth; which may be considered as indicating that they spring from the bottom of some gulf, the cavities of which extend far into the bowels of the earth; and their limpid character is almost a proof that they become purified by filtrating through long subterraneous sinuosities; so that time may perhaps have effaced the exterior and superficial traces of a volcano, and the basin of the lake have been, nevertheless, its effect and its crater. Whither do these waters go? This I conceive may be more easily answered, although there is no apparent issue for them."

From this lake with no visible outlet he supposes there is a filtration northward so as to supply the water of lake *Puposky*, thus becoming the source of Bloody river, and also southward, where they appear in a little basin at the foot of the hill, about eighty feet in circumference, thus becom-

ing also "the actual sources of the Mississippi." This remarkable lake, which he styled lake Julia, is described as "about three miles around, in the shape of a heart, and it may be truly said to speak to the very soul. Mine was not slightly moved by it. It is but justice to draw it from the silence in which geography, after so many expeditions, still suffered it to remain, and to point it out to the world in all its honorable distinction."

The stream from the small basin that has been noticed, on the south side of the hill, runs directly south, and after three miles reaches Turtle lake. "The majestic river, which embraces a world in its immense course, and speaks in thunder in its cataracts, is at these, its sources, nothing but a timid Naiad, stealing cautiously through the rushes and briars which obstruct its passage. The famous Mississippi, whose course is said to be twelve hundred leagues, and which bears navies on its bosom, and steamboats superior in size to frigates, is at its source merely a petty stream of crystalline water, concealing itself among reeds and wild rice which seem to insult over its humble birth."

TURTLE LAKE.

Turtle lake, including its bays, he estimates at more than one hundred miles in circumference. The first lake below he christened *Jeromine,* from the countess to whom his letters were addressed. Another, seven or eight miles further east-southeast, he named *Monteleone.* A stream coming into the Mississippi from the northwest the Indians styled *Scisaiaguay,* or Heron river. He passed up this tributary, and found it drained a number of small basins, the highest of which he named lake *Torrigiani,* "from the stately and spreading trees which overhang its banks." From this he made a portage northward and came to another lake of an oval form, which he named *Antonelli,* four or five miles across. This discharges into Turtle lake near the point at which the Mississippi leaves it.

Descending below Turtle lake he passed four lakes, which he named *Providence* lakes, on account, as he says, of the fields of wild rice which Providence has formed there, the ears of which resemble those of the land of promise. The river, throughout, to Red Cedar lake, is described as having a deep, steady and uniform channel and current, the land all being low and frequently submerged or shaking.

1823, Beltrami.]

BELTRAMI'S OPINION OF THE ITASCAN SOURCE.

Mr. Beltrami heard of the Itascan branch of the upper Mississippi, but he regarded it as a subordinate tributary, and did not pursue it. Had he not rested his claim to the discovery of the true source of the Mississippi, confidently on the principle stated, he certainly would have penetrated to its "western sources". He was a man of zeal, adventure, energy and ambition, and never would have left the region without visiting what he styles *Doe lake*, had he supposed there was a possibility of doubting the actuality and correctness of his discovery. This western branch he learned of under the name of the *River of lake Traverse*, and says that above lake Traverse (Pemidji), it issues from a lake "which receives no tributary stream, and seems to draw its waters from the bosom of the earth. It is here, in my opinion, that we shall fix the western sources of the Mississippi."

Respecting the geology of the country, a single extract from Mr. Beltrami's pen will show at once the amount and character of the information he gives us. The following is his comment on the valley of the Redwood river, near its mouth, where the expedition passed.

BELTRAMI AT THE MOUTH OF THE REDWOOD RIVER.

We now reached a valley of the most lovely and interesting character. Never did a more striking illusion transport my imagination back to the classic lands of Latium and Magna Græcia. Rocks scattered, as if by art, over the plain, on *plateau*, and on hills, were, at a little distance, perfect representations of every varied form of the ruins of antiquity. In one place you might think you saw thermal substructures, or those of an amphitheatre, a circus, or a forum; in another the remains of a temple, a cenotaph, a basilicon, or a triumphal arch. I took advantage of the time which chance procured me, to survey this enchanted ground; but I went alone, that the delicious reverie it threw me into might not be broken by cold heartedness or presumption. My eyes continually met new images; at length they rested on a sort of tomb, which for some time held me motionless. A thousand afflicting recollections rushed to my heart; I thought I beheld the tomb of Virtue and of Friendship; I rested my head upon it, and tears filled my eyes. The spot was of a kind to soften and embellish grief, and I should have long given myself up to its sweet influence had I not been with people who had no idea of stopping for any thing but a broken saddle, or some such important incident.

The rocks are granitic, and of so beautiful and varied a quality, that the tricking dealers of the Piazza Navona, at Rome, would sell them to the most enthusiastic, and,—in their own opinion,—the most learned antiquarians, as oriental and Egyptian porphyry or basalt, which are now generally admitted to be merely granite more elaborated by time and water.

BELTRAMI AT THE FALLS OF ST. ANTHONY.

What a new scene presents itself to my eyes, my dear Madam! How shall I bring it before you without the aid of either painting or poetry? I will give you the best outline I can, and your imagination must fill it up. Seated on the top of an elevated promontory, I see, at half a mile dis-

tance, two great masses of water unite at the foot of an island which they encircle, and whose majestic trees deck them with the loveliest hues, in which all the magic play of light and shade are reflected on their brilliant surface. From this point they rush down a rapid descent about 200 feet long, and, breaking against the scattered rocks which obstruct their passage, they spray up and dash together in a thousand varied forms. They then fall into a transverse basin, in the form of a cradle, and are urged upwards by the force of gravitation against the side of a precipice, which seems to stop them but a moment, only to increase the violence with which they fling themselves down a depth of twenty feet. The rocks against which these great volumes of water dash, throw them back in white foam and glittering spray; then, plunging into the cavities which this mighty fall has hollowed, they rush forth again in tumultuous waves, and once more break against a great mass of sandstone forming a little island in the midst of their bed, on which two thick maples spread their shady branches.

SCHOOLCRAFT AT ITASCA LAKE IN 1832.

In 1832 Mr. Henry R. Schoolcraft conducted an expedition to the source of the Mississippi river, pursuing nearly the same route from Sault St. Mary, as in 1820. From Upper Red Cedar lake he passed up the Mississippi under the guidance of a Chippewa chief named Ozawindib, accompanied by Dr. Douglass Houghton, afterward state geologist of Michigan, Lieut. James Allen, U. S. A., and Rev. W. T. Boutwell, and a sufficient number of packers and canoe-men. Mr. Schoolcraft regarded himself as the discoverer of the true source of the river, and in the absence of published accounts by other travelers it was a just claim. Still there is no doubt that among the *coureurs des bois* of the fur companies there were several who knew well that the Mississippi could not be followed further than to Itasca lake. Mr. Schoolcraft's claim was generally scouted among the white residents of the northwest who were at all conversant with the country during the previous twenty-five years. The statement of Mr. Morrison of his visit to the lake in 1804 has already been referred to, and to him it is just to accord the discovery of the source of the great river, although first published so late as 1856. Mr. Schoolcraft's expedition, however, enjoyed the zest, as it received the popular acceptance, of a first discovery, and he fully described the route he took, giving several names to lakes before unknown. He named the first lake west of Cass lake, formed by the expansion northward of the Mississippi, lake Andrusia. This is in T. 146, R. 31. The next, which enlarges toward the south, situated in T. 146, R. 32, he styled the *Twin* of lake Andrusia. Its Indian name was Pamitascodiac, preferable to that which he applied. A few miles above this point begin a series of rapids, ten in number, styled Metoswa rapids. The Indian name Pemidjegumaug

(now lake Pemidji), which is the Chippewa for *Lac Travers*, Mr. Schoolcraft saw a good reason for rejecting in favor of Queen Anne, whose name he applied to that lake. The little lake immediately south of it he dedicated to Washington Irving. Half a mile above this he reached what he styled the "primary forks of the Mississippi," that from the west, or Itascan fork, bearing the larger volume of water. Under the guidance of Ozawindib, the party took the southern fork, through which, by a series of lakes, they attained a point nearly east from Itasca lake. They then made a *grande portage* over the drift hills intervening, to Itasca lake, descending the other fork to Pemidji lake the following day. He bestowed the name of Marquette on the first of the lakes of the south fork, and on the second that of La Salle. The third lake, of larger dimensions, deemed by Lieut. Allen to be ten miles long, he named Plantagenet. Passing the junction of the Naiwa river and at the same time ascending a rapid by means of a portage trail of about two miles, the stream was again struck at a point a few miles below Assawa or Perch lake. A short distance above this lake the party left the south fork, by portage to Itasca lake,* the elevation passed over being estimated at 1695 feet above the gulf of Mexico.

In descending the other fork of the river, from Itasca lake, Mr. Schoolcraft found the outlet to be "quite a brisk brook, with the mean width of ten feet and the depth of one foot." After passing some severe rapids he mentions a river by the name of Chemaun, entering on the right bank, which nearly doubles the volume of the stream. Further down enters a stream, with a lake near its mouth, which the Indians styled Piniddiwin (or Carnage) river, but which he denominated De Soto river. Both these streams enter the Mississippi in T. 146, R. 35. A small stream below, originating in a lake, in T. 146, R. 34, coming in on the left, he designated Allenoga, "putting the Iroquois local terminal in *oga* to the name of the worthy officer who traced out the first true map of the actual sources of the Mississippi." He also applies names to a series of lakes between Leech lake and the headwaters of the Crow Wing river, but his descriptions cannot be made to agree with any published maps of that country, particularly in respect to distances traveled, and the sizes of the lakes, although they are

*"*Having previously got an inkling of some of their mythological and necromantic notions of the origin and mutations of the country which permitted the use of a female name for it, I denominated it Itasca.*"—Schoolcraft Disc. Sources Miss Mr. Neill has stated on the authority of Rev. W. T. Boutwell, who accompanied the expedition, that the name *Itasca* was derived by Schoolcraft from the Latin words *veritas* and *caput*, meaning *true source*.

represented on the map accompanying his *Narrative*, published in 1834. Like nearly all pioneer travelers he over-estimates distances. The following names he applies to lakes between Leech lake and the mouth of Shell river, and they should be perpetuated on the settlement of the country, viz.: Warpool, Little Long, lake of the Mountain, lake of the Isle, Longwater lake (the source of this branch of Crow Wing river), Little Vermilion, Birch, Lac Plè, Assowa, Lac Vieux Desert, Long Rice, Allen, Illigan and Douglass. Schoolcraft descended the Crow Wing river to its union with the Mississippi, being the first to explore it, and to render an account of its course.*

LIEUT. JAMES ALLEN'S REPORT OF SCHOOLCRAFT'S EXPEDITION OF 1832 TO THE SOURCE OF THE MISSISSIPPI RIVER.

Lieut. Allen's report† is accompanied by a map of the country from the Red river of the North to the Bois Brulé river of Wisconsin, extending from lake Pepin to Red lake. On this map the Cloquet river is named Rapid river. The principal sources of the St. Louis river are represented to come from Vermilion lake and White Wood lake, the latter probably being intended for what is now known as Basswood lake. The branches of the St. Croix river from the west, in descending order, are Pine river, Nenandag river, Fowle river, Kettle river, Snake river, and three others above St. Croix lake. One also joins St. Croix lake from the west. Ascending the Mississippi river above the falls of St. Anthony, the following are represented as its eastern tributaries, Raccoon river (now Coon creek in Anoka county), Rum river, Leaf or St. Francis river, Elk river, Clear river, Long river (having its source in Long lake situated west of Mille Lacs), Muddy creek, West Savanna river, Swan, Trout, Prairie and Deer rivers; the last being the first stream above Pokegama falls. The western branches above the falls of St. Anthony,

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* Resulting from this expedition were the following scientific papers:—
1. Limits of the range of the *Cervus sylvestris*, in the northwestern part of the United States. By Henry R. Schoolcraft. [Northwest Journal.]
2. Description of the *Fringilia vespertina*, discovered by Mr. Schoolcraft in the Northwest, By William Cooper. [An. N. Y. Lyc. Nat. Hist.]
3. List of shells collected by Mr. Schoolcraft in the western and northwestern territory. By William Cooper.
4. List of species and localities of plants collected in the northwestern expeditions of Mr. Schoolcraft, of 1831 and 1832. By Douglass Houghton, M. D.
5. A report on the existence of deposits of copper in the geological basin of lake Superior By Dr. D. Houghton.
6. Remarks on the occurrence of native silver and ores of silver in the stratification of the basins of lakes Huron and Superior. By Henry R Schoolcraft.
7. A general summary of the localities of minerals observed in the Northwest in 1831 and 1832. By Henry R. Schoolcraft.
8. Geological outline of the Taquimenon valley of lake Superior. By Henry R. Schoolcraft.
9 Suggestions respecting the geological epoch of the deposit of sandstone rock at St. Mary's falls. By Henry R. Schoolcraft.

Of the above, those not otherwise noted, are in the appendix to Schoolcraft's work. *Discovery of the Sources of the Mississippi.*

†American State Papers Vol. V. Military Affairs p. 312.

1832, Allen.]

so far as named, are Rice (probably Shingle creek in Hennepin county), Crow, Sac, Elk, Swan, Crow Wing, Pine, and Willow. The Crow Wing has a northern tributary near its mouth called Salt river, coming from Gull lake. The Shell river rises in Shell lake, and the Leaf river is not named. Although his journal alludes to Leaf river, giving it a size nearly as large as the Crow Wing where they join, and states its source is in Leaf lake fifty miles above its mouth, yet neither is represented on his map. He has incorrectly named it "Shell river," which really joins the Crow Wing much higher up, as represented by Schoolcraft, and later by Nicollet. A large tributary of the St. Peter's river from the north is Beaver river, undoubtedly the Pomme de Terre (or Tipsinah) river. Big Stone lake is named Big Salt lake, and the Minnesota river above that lake is called Cold creek. The head of the Coteau is styled "Thunder Nest Mountains," and a series of "salt ponds" is represented just to the east. The eastern branches of the Red river of the North are the Chippewa, the Wild Rice, Plum, Sand Hill and Red Lake rivers. The map is characterized by the representation of marked hill-ranges, sometimes called mountains. The great moraine of western Minnesota is shown from a point north of Cass lake southward to near the source of the Crow river, under the name, "Dividing Ridge between the Mississippi and Red rivers." The "Cabotian Mountains" begin between the Cloquet river and lake Superior and extend southwestwardly across the St. Louis river, forming the *Dalles*, and several miles further. A range designated "Pine hills", extends from the upper St. Croix lake westward nearly to the source of Snake river. The Nemadji, or Left Hand river, entering lake Superior near Superior City, is named "La Rivière à Gauche." Red Cedar lake is near the Mississippi northwest of Mille Lacs, and Red lake is between it and Long lake toward the southwest, and empties into the Mississippi by a small stream.

Lieut. Allen further defines the geography of the upper Mississippi in his journal, mentioning various streams and lakes that are not put down on his map. In first making the "grand portage" through the Cabotian mountains, he describes it as running back from the river in some places four or five miles but touching it at "La Roche Galet." The rock in the river at the upper end of the portage is described as "coarse, hard, argillite rock," and the country through which it passes as rich, and timbered with

birch, pine and sugar maple. "Three miles" above the grand portage begins the *portage à couteau*, or knife portage, on the west side of the river, beginning at a small island of argillyte which rises abruptly to the hight of 100 feet, in the midst of the river at the foot of a strong rapid. This portage is stated to be a mile and a half long. "Nine and a half miles" above the knife portage he mentions continued rapids through argillyte rock for about four miles. The St. Louis river of the map he styles Fond du Lac river in his journal. The country on the portage to the West Savanna river is described as very swampy, but divided by a ridge of higher land timbered with sugar maple, birch and linn, running southeastwardly, about a mile and a half from the West Savanna river. It is less than half a mile wide, and is succeeded by swamps again on its west or Mississippi side, which extend with some alternating ridges of higher land to the West Savanna river. The highest point on the portage is about 150 feet above the Savanna rivers. Sandy lake overflows with the Mississippi, and the great flood covers the country for many miles around. At "Pacagama falls" the descent of the river is between twenty and thirty feet in the distance of a hundred yards, and is nowhere perpendicular, but the channel is much contracted. In one place the whole water runs down the surface of a smooth, plain rock for a distance of forty feet, with a pitch of about twelve degrees. The river is here said to break through a low ridge that traverses its course perpendicularly in a northeast and southwest direction, the rock being of granular quartz. At a small stream which joins the Mississippi a short distance above the falls, from the west, commence the great swamps and savannas which border the Mississippi on one or both sides for a great distance above. By way of Lac la Crosse (remarkable for the fine whitefish it afforded) and a small river extending three or four miles to another little lake, he left the Mississippi, at last, making a portage of 800 yards to Little Winnipeg lake, through which the Mississippi runs. A few miles further up he reached Big Winnipeg lake, from which he says there is a short portage to a river of Rainy lake, probably the Big Fork river. Red Cedar lake, the former name of Cass lake, derived its name from a little high island called *Red Cedar island.*

1832, Allen.]

LIEUT. ALLEN AT THE SOURCE OF THE MISSISSIPPI, AND ON THE CROW WING RIVER.

In company with Mr. Schoolcraft, Lieut. Allen left Cass lake under the guidance of *Yellow Head*, an Indian of the Cass lake band, for the exploration of the Mississippi river to its source. Passing Lac Travers, now lake Pemidji, which he describes as a beautiful lake about ten miles long from north to south and about half as broad, surrounded by pine woods which rise into high hills on the north and northwest, forming a part of the chain dividing the waters of the Mississippi from those of the Red river, he followed a broad channel, 100 yards long, and reached another small lake. Half a mile above this he reached the forks of the river, the branches being nearly of the same width, but the right hand branch having the most water discharge. He ascended the left branch, and in about twelve miles reached lake Rahbahkanna, or Resting lake, which is four miles in diameter and nearly round. Ascending the river still further, a distance estimated by him between fifty and sixty miles, he reached Usaw-way, or Perch, lake, which is about two miles long and half a mile broad. From this lake he set out overland to *Lac la Biche*, which was supposed to be the source of the larger fork of the Mississippi, making a portage of six miles, and struck the lake near the end of its southeastern bay. The portage passed over a rough country, two or three hundred feet above the lake, with tamarack swamps and Banks' pine, the latter growing in a poor and sandy soil, hung with lichens and without animal life. Mr. Schoolcraft hoisted a flag on a high staff, on the island, and left it flying. Lac la Biche is said to be about seven miles long and from one to three broad, but of irregular shape, conforming to the bases of the pine hills which for a great part of its circumference rise abruptly from its shore. Its shores are formed of boulders of primitive rock but have no rock in place. Schoolcraft island is 150 yards long and 50 yards broad. The Indian who acted as guide declared this lake to be the "true source and fountain of the longest and largest branch of the Mississippi." He had hunted all round it, and said there was a little creek too small for the smallest canoes to ascend, emptying into the south bay of the lake and having its source "at the base of a chain of high hills, which we could see not two miles off." To the

west he saw distinctly "a range of almost mountains, covered with pine, which was undoubtedly the chain dividing us from the waters of the Red river." Respecting the "Julian sources" Lieut. Allen says: "There is, however, a little stream, Turtle river, entering Cass lake from the north, in the route of traders to Turtle lake and Red lake, but it is a very small and insignificant stream, and is only forty-five miles in length." On leaving Lac la Biche he found the Mississippi twenty feet broad and two feet deep with a current two miles per hour. It soon ran through a chain of high pine hills, where the channel contracted very much and numerous rapids occurred, of very great fall over boulders of primitive rock, the river running for a distance in a deep ravine.

Lieut. Allen made a series of portages, and traverses of little lakes, from the south end of Leech lake "to Long lake, the source of Crow Wing river. These portages were all short, and over pine ridges, with yellow and pitch pine: the lakes were deep, clear and beautiful, with pine hills coming down to the water. The lakes had neither inlet nor outlet, and from the summits of the hills several could be seen at once. Long lake is only the beginning of a chain of eleven pretty little lakes near together, from two to five miles in length, from which the Crow Wing takes its rise."

In descending the Crow Wing river Lieut. Allen mentions the Leaf and the Shell rivers, but gets their names interchanged; also the Long Prairie river, but he does not name it on his map.

LIEUT. ALLEN ON THE MISSISSIPPI.

At the "little falls" he describes the river as forming a chute, and contracted from 300 yards to fifty yards, the fall amounting to ten feet in sixty, "through a formation of talcous slate rock, the first rock we had seen in place since leaving the falls of Pacagama. A little further down we passed Pike rapids, and the site of Pike's blockhouse, where Lieut. Pike wintered his command in 1805–'6; and a little further a chain of rapids called the 'grand rapids,' where the river runs over an extensive rock formation of granular quartz." He also mentions another rapid at the mouth of Elk river, and the "big falls" at the mouth of Sac river, and a short distance above the latter the mouth of the Little Sac, or Wattah, river; also, the

1835, Featherstonhaugh.]

"mouth of the St. Francis, or Parallel, river, a considerable stream running parallel with the Mississippi, and navigable for canoes 150 miles." The Rum river, on the same side, is said to be navigable for canoes 150 miles to "Mil Lac, a lake almost as large as Cass lake."

The whole descent at the falls of St. Anthony, including the rapids, he estimated at eighty feet, the perpendicular fall at eighteen feet.

LIEUT. ALLEN ON THE ST. CROIX RIVER.

The St. Croix enters the Mississippi by a mouth seventy-five yards broad, opposite an island of the latter, and fifty miles below Fort Snelling. Its right bank at the mouth is a perpendicular rock eight or ten feet high (calcareous sandrock) and the left is a low acute point. A few hundred yards from the mouth it opens into a long, narrow lake, lake St. Croix, which seems to fill or lie in a valley, the hills rising to form its banks, on each side, in green gentle slopes. * * * * A few miles above where I encamped, the river is traversed by a primitive rock which for a distance of one or two hundred yards, confines the channel within perpendicular walls fifty feet high, and rises in a high abrupt little island in the middle of the stream, but occasions no rapid. Above this the banks are high and steep, but not rocky, till within a mile of the falls, when the channel becomes suddenly contracted to from fifteen to thirty yards, by rocks forming mural precipices on each side fifty and a hundred feet high, between which the river, though very deep, is urged with great velocity. This rock and the narrow channel continues, with a few interruptions of caves and fissures, one mile up, to the *falls*, where the river is but forty feet broad, and rushes with great force and violence down a fall of fifty feet in three hundred yards. The whole of this rock is greenstone trap, and its surface presented to the river in high cliffs is exceedingly rugged and broken, prismatic fragments being continually detached from it and tumbled down.

In the further ascent of the St. Croix river to the upper St. Croix lake, Lieut. Allen encountered great difficulties, on account of being abandoned by Mr. Schoolcraft and his party, and on account of the almost interminable rapids. His description of this stream above the falls of St. Croix confirms Duluth's assertion as quoted by La Salle, that in descending it he "had passed forty leagues of rapids."

G. W. FEATHERSTONHAUGH, U. S. GEOLOGIST.

In the summers of 1834 and 1835, an English gentleman, under the title of U. S. Geologist, was commissioned by Col. J. J. Abert, of the bureau of topographical engineers, with loose and apparently aimless instructions, to execute rambling explorations in the western country. The first year he visited the Red river of Arkansas, and the second he proceeded to the vicinity of that elevated ridge which separates the Missouri river from the St. Peter's. From the latter expedition resulted two works—one entitled "Report of a geological reconnoissance made in 1835, from the seat of govern-

ment by the way of Green bay and the Wisconsin territory to the Coteau des Prairies, an elevated ridge dividing the Missouri from the St. Peter's river," printed by order of the Senate in 1836, and the other "A Canoe Voyage up the Minnay Sotar," published in London in 1847.

The latter is taken up largely with personal and journalistic details, and the former with a statement of geological principles, as understood by English geologists of that day. In his geological report proper Mr. Featherstonhaugh ascribes the existence of lake Pepin to the entrance of the Chippewa river, nearly at right angles to the Mississippi, damming up the water above it; mentions Castle rock as an instance of how "the mineral level has been reduced," and gives an illustration of it, in which it appears very much as it does at the present day; visited Fountain cave near St. Paul, and describes it under the impression that it is that visited by Carver; speaks of the "carboniferous limestone" at Fort Snelling, correcting Mr. Keating's error in supposing fallen pieces of limestone from the top of the bluff were *in situ* at the level of the river, and gives the following account of the falls of St. Anthony:

FEATHERSTONHAUGH AT THE FALLS OF ST. ANTHONY.

An island about 450 yards long divides the Mississippi into two parts at the falls of St. Anthony, which have a very irregular outline, owing to the soft sandstone being washed out unequally in places, and the superincumbent strata of limestone falling down in large blocks; these are piled up in large quanities on the bed of the river immediately at the foot of the falls. That part of the river on the north side of the island is about 220 yards wide. There is a very fine, smooth section of the rocks here to the water, about ninety feet high. I should think the fall would not average more than twenty feet. The immense slabs which have fallen from the limestone beds at the top are covered with producta, mixed with spirifers and cardia. On the south side of the river the line of the falls is a very irregular curvature, and measures about 450 yards to the island; the hight of the fall does not appear so great on this side, owing perhaps to the bed of the river being so much choked up with the fallen slabs. It is a wild rocky scene, but deficient in interest as a waterfall on account of its want of hight. To a geologist, however, it is exceedingly interesting, finding here the uninterrupted continuation, for one thousand miles, of the carboniferous limestone with its characteristic fossils. At the south side of the falls I got some exceedingly fine ones, including beautiful specimens of delphinula, bellerophon, nautilus, euomphalus, &c.

FEATHERSTONHAUGH ASCENDS THE MINNESOTA RIVER.

Mr. Featherstonhaugh's geological notes on the Minnesota river may be summarized somewhat as follows. Mentioning Carver's river, he says: "Something short of fifty miles from the fort there is a short rapid with

1835, Featherstonhaugh.]

a strong current. Above this is another rapid, with sandstone in place on the right bank, the same as at the fort." This is probably the rapid near Carver.

Further up the Bois Franc district, a stream comes in from the left bank called Wee-tah Wakatah, or Tall island,* and about five miles higher up some ledges of horizontal fawn-colored limestone jut out on the right bank, very cherty and somewhat vesicular; near the surface it takes a reddish salmon-color, resembling very much some beds I had previously seen on the Wisconsin and upper Mississippi. Within a few yards of these ledges, and north of them, a beautiful pellucid stream comes in, containing the purest water I had seen in the country. I could not learn that any name had been given to it, and as it is in the immediate vicinity of the first calcareous rock I had met with in place here, and its purity rendering it a very rare stream in a country where all are turbid, I named it Abert's run, after Col. Abert, of the United States army, and chief of the topographical bureau.†

Eight or nine miles below Traverse des Sioux is Myah Skah, or White Rock,‡ where he mentions an escarpment consisting of forty feet of granular sandstone surmounted by ten feet of fawn-colored limestone, the same as that at Abert's run. This sandstone, he says, is formed of semi-transparent grains loosely adhering, with nodules here and there, where they are cemented by a paste of clear siliceous matter; the whole making a hard flinty mass resembling siliceous oolite. At the junction of the limestone with the sandstone he notes a seam of marly, mineral matter "containing a great deal of silicate of iron," of a bluish-green color. About two miles above Moon creek§ (or camp Crescent, of Keating) he saw the sandstone and limestone again in place; again, at a point three miles higher, a long bluff twenty-five feet in hight. Five miles further the White Earth bluff occurs, where he mentions multitudes of large boulders on the prairie, some of which he estimates at 100 tons' weight. Beyond this point, having passed an island about 400 yards long, the current becoming very strong, with bold bluffs and many boulders, he judged that the river had worked its way through a ridge. Sixteen miles beyond this point he estimated the bluffs at 150 feet in hight, and found the current of the river swift, this being near the mouth of the Makato, or Blue Earth river.

In searching for the supposed copper mines of Le Sueur, under the guidance of his interpeter, Milor, he could ascertain nothing, not even a traditional report, of anything like a copper mine in that region. The

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* High Island creek, four miles north of Henderson.

† The inaccuracies of Mr. Featherstonhaugh's description, even with the aid of his small map, render it impossible to state what stream is here meant; but the bluff of rock seems to be that situated at Rocky point, See. 30, Blakely.

‡ Near Ottawa.

§ Keating ascribes the name *Crescent* to a bend in the Minnesota river, but Mr. Featherstonhaugh says it is due to a series of half-moon turns in the little creek that enters from the east a short distance below the Traverse des Sioux.

Indians concurred in saying that there were some bluffs a few miles beyond the St. Peter's where they procured a blue earth with which to paint themselves; and this point was so precisely described that he had no difficulty in finding it. In passing up he evidently regarded the Le Sueur as the main stream, and refers to the fork now styled the Blue Earth, as "a fork of the river from the left bank." This he ascended, finding little current, and at a place estimated at two miles from the fork, came to a bluff about 150 feet high on the left bank, containing the blue-earth locality. "On climbing it I found the same horizontal limestone and siliceous sandstone common to the whole country. Toward the top was a broad seam of bluish clay intermixed in places with silicate of iron, being a continuation of the deposit I had seen before at Myakah, and valuable only for the savages to paint themselves with. From this bluff I advanced in a westerly direction about two miles, over a part of the country grown up with small poplars, hazels, wild roses and grass, in the hope of seeing the Coteau des Prairies, and of making arrangements to proceed to it from this quarter; but I saw nothing of the kind from any eminence which I could gain, and having in my hand, and reading on the spot, what had been said by M. Le Sueur, his mountains and his copper mines, I found myself obliged to come to the conclusion that these discoveries were fables invented to give himself influence at the court of France. Before I left the northwest country, and after I had visited the Coteau des Prairies, I found it was distant at least sixty miles from this spot, which leaves only the bluffs of the river to represent the mountains spoken of in the manuscript of La Harpe."*

Twenty miles above the mouth of the Blue Earth, he states that the Minnesota "has made a recent cut-off and abandoned its old bed; not far from this place a large mass of sandstone is in place in the middle of the river." Swan lake lies nearly five miles north of this place.

FEATHERSTONHAUGH DESCRIBES THE QUARTZYTE AT REDSTONE.

"About twenty-five miles above Makato some red earth bluffs occur on the left bank, with numerous boulders. From this point the general appearance of the soil and country begins to vary, and announces a change

*The deposit containing the pigment he places in that seam "which divides the limestone from the sandstone," when describing this locality in the "Canoe Voyage."

1835, Featherstonhaugh.]

in the formations, and five miles further some rocky bluffs come in on the left bank, the lower beds of which are a brick red color and of a fine grain. On landing and leaving the bank I found the country covered with beds of red gritstone of a very hard quality, inclined about fifteen degrees. These rocks are full of potholes, some of them a foot in diameter and eight inches deep, and are as smooth as metal. The carboniferous limestone formation seems to terminate here, and to be stopped by a conglomerate resembling in its mineralogical characters the upper beds of the Old Red sandstone. The river has in old times passed over these rocks, worn the pot-holes, and made them so glassy smooth."

He mentions the first granite met, known as "little rock," and says that no other kind of rock was seen in place during his further progress toward the northwest.

THE COTEAU DES PRAIRIES.

He estimated the Coteau to rise 450 feet above the level of the general prairie; the ascent being so gentle that one is hardly aware of going up hill. The ascent perhaps continues two and a half miles, and is not more than at the rate of 160 feet to the mile. "The Coteau itself is only another upland prairie, somewhat more diversified than that I had left behind, having numerous small wooded lakes on its surface, which have a very picturesque appearance. From the plateau here there is an extensive view of the prairies below, with the lakes. The prairies in every direction are bounded only by the horizon; a few occasional trees indicate stagnant water. It is two good days' march from here to the Shyan, and eight further to Pembina, on Red river of lake Winnipeg, the whole of it over a prairie country with many small lakes and occasional wood. The Nid de Tonnère, or Nest of Thunder, a name derived from some Indian tradition, comprehends a small tract of country with a very irregular surface, where knolls, depressions and small wooded lakes prevail. The sand-hills I have before spoken of as lying in front of the Coteau des Prairies, extend into this vicinity and still further to the northwest. Farther to the northwest are several saline lakes, one of which, named Saline lake on the map, is about ten miles long. On the shores of these lakes crystallized salt is found in dry seasons, when the surface has been much evaporated; muriate of lime appears to be mixed with

it. As there is no rock in place around here, conjectures only can be formed upon the nature of the subjacent beds. * * * * * * * * The Coteau des Prairies, about which very little has been known, is a very broad ridge of land dividing the waters tributary to the Missouri from those which discharge themselves into the St. Peter's and into the Red river of lake Winnipeg. Its general direction is about north-northwest and south-southeast, though in places in appears to be irregular. To the south it comes down to the sources of the Makato, whilst to the north it terminates for a while near the sources of the Psee, where a flat country comes in, intersected by the Shyan and the Goose rivers. *Lac du Diable* is in this area with Turtle river. Here the Coteau rises again, to the north, but it is called the 'Pembina hills' by the traders; these extend beyond the Assinaboin river and die away about Flat lake, near seventy miles from lake Winnipeg. East of the Pembina hills there are salt springs, and from the somewhat vague accounts I received from the Indians, there is coal in their vicinity. A very respectable trader informed me he had once picked up some bituminous coal on the shore of lake Traverse."

GEORGE CATLIN AT THE RED PIPESTONE QUARRY.

Although Mr. Catlin is best known as an Indian delineator, he has also left a brief geological description of the pipestone country.* He was the first to carry a sample of the red pipestone away with him, and take measures to have it subjected to chemical examination. Such examination was made by Dr. C. T. Jackson, of Boston, who gave the substance the mineralogical name of *catlinite*.†

Mr. Catlin had plans laid for visiting the pipestone quarry in 1835, when at Fort Snelling, but hearing of the expedition of Mr. Featherstonhaugh, under government directon to explore the Coteau des Prairies, he abandoned his project. Subsequently hearing that that gentleman did not

*American Journal of Science, First Series, Vol. 38, p. 138.

† In the journal of the council of the first legislative assembly of the territory of Minnesota, September 11, 1849, is a letter of H. H. Sibley, presenting a sample of this stone to the territory for use in the Washington monument at the city of Washington. Its size was stated to be "about two and a half feet in length, and a little over one and a half in breadth, and two inches in thickness" Mr. Sibley objects to the use of the designation *catlinite* since it seems to have been given on the assumption that Mr. Catlin was the first white man who had visited that region. "whereas it is notorious that many whites had been there and examined the quarry long before he came to the country This designation therefore is clearly improper and unjust The Sioux term for the stone is *E-yan-shah* by which I conceive it should be known and classified."

Mr. Schoolcraft, in 1854, published for the first time a report on the Geology and Mineralogy of the expeditions made by him to the Mississippi region. This appears in the appendix to his "Summary Narrative." It purports to have been written in 1822, and addressed to John C. Calhoun, Secretary of War. In this report the red pipestone of Minnesota is named with the true mineral name *opwagonite*, which he says is the Algonquin word for calumet stone. If this word had been applied to this mineral as early as 1822, and had been published even as early as 1832, it would antedate Jackson's name of *catlinite*. But there is no evidence that it was published—indeed the references of Mr. Schoolcraft to his own early descriptions of the substance do not bear out his implication of such use of the name.

1837, Catlin.]

visit the quarry, he carried out his design, starting from New York, "a distance of 2,400 miles, for which purpose I devoted eight months, traveling at a considerable expense, and for a great part of the way with much fatigue and exhaustion."

Starting on horseback from the falls of St. Anthony, in company with "a young gentleman from England of fine taste and education," and under the guidance of a faithful Indian, he followed the usual route along the south side of the Minnesota river to the Traverse des Sioux, where he crossed the river; he recrossed it at a point about thirty miles above the mouth of the "Terre Bleue," near the mouth of the Waraju, and thence, leaving the Minnesota, pursued a course "a little north of west," steering for the Coteau des Prairies. He represents the vast prairie that he passed over as one of the most beautiful countries in the world, for a distance of one hundred and twenty or one hundred and thirty miles. It everywhere showed the richest soil, and an abundance of good water which flowed from a thousand living springs.

For many miles in the distance before us we had the Coteau in view, which looked like a blue cloud settling down in the horizon ; and when we had arrived at its base, we were scarcely sensible of the fact, from the graceful and almost imperceptible swells with which it commences its elevation above the country about it. Over these swells, or terraces, gently rising one above the other, we traveled for a distance of forty or fifty miles, when we at length reached the summit, and also the pipestone quarry, the object of our campaign. From the base of this majestic mound to its top, a distance of forty or fifty miles, there was not a tree or a bush to be seen in any direction. The ground was every where covered with a green turf of grass, about five or six inches high ; and we were assured by our Indian guide that it descended to the west, toward the Missouri, with a similar inclination, and for an equal distance, divested of everything save the grass that grows and the animals that walk upon it.

On the very top of this mound or ridge, we found the far-famed quarry, or fountain, of the Red Pipe, which is truly an anomaly in nature. The principal and most striking feature of this place is a perpendicular wall of close-grained, compact quartz, of twenty-five or thirty feet in elevation, running nearly north and south, with its face to the west, exhibiting a front of nearly two miles in length, when it disappears at both ends by running under the prairie, which becomes there a little more elevated, and probably covers it for many miles, both to the north and south. The depression of the brow of the ridge at this place has been caused by the wash of a little stream, produced by several springs on the top of the ridge, a little back from the wall, which has gradually carried away the superincumbent earth, and having bared the wall for a distance of two miles, is now left to glide for some distance over a perfectly level surface of quartz rock, and then to leap from the top of the wall into a deep basin below, and from thence to seek its course to the Missouri, forming the extreme source of a noted and powerful tributary called the Big Sioux.

This beautiful wall is perfectly stratified in several distinct horizontal layers, of light, gray and rose, or flesh-colored, quartz ; and through the greater part of the way, both on the front of the wall, and over acres of its horizontal surface, it is highly polished, or glazed, as if by ignition.

At the base of this wall, and running parallel to it, there is a level prairie of half a mile in width, in any and all parts of which the Indians procure the red stone for their pipes by digging through the soil and several slaty layers of the red stone to the depth of four or five feet. From the very numerous marks of ancient and modern digging, or excavations, it would appear that this

place has been, for many centuries, resorted to for the red stone, and from the great number of graves and remains of ancient fortifications in the vicinity (as well as from their actual traditions) it would seem that the Indian tribes have long held this place in high superstitious estimation, and also that it has been the resort of different tribes, who have made their regular pilgrimages here to renew their pipes.

It is evident that these people set an extraordinary value on the red stone, independently of the fact that it is more easily carved and makes better pipes than any other stone; but whenever an Indian presents a pipe made of it, he gives it as something from the Great Spirit; and some of the tribes have a tradition that the red men were all created from the red stone, and that it thereby is "a part of their flesh." Such was the superstition of the Sioux on this subject, that we had great difficulty in approaching it, being stopped by several hundred of them, who ordered us back and threatened us very hard, saying that no white man had ever been to it, and that none should ever go. * * * * * * * * * *

The red pipe-stone will, I suppose, take its place, amongst interesting minerals; and the "Coteau des Prairies," will become hereafter an important theme for geologists, not merely from the fact that it is the only known locality of that mineral, but from other phenomena relating to it. The single fact of such a table of quartz resting in perfectly horizontal strata on this elevated plateau is of itself, as I conceive, a very interesting subject for investigation, and one which calls upon the scientific world for a correct theory with regard to the time when, and the manner in which, this formation was produced. That it is a secondary and sedimentary deposit, seems evident; and that it has withstood the force of the diluvial current, while the great valley of the Missouri, from this very wall of rocks to the Rocky mountains, has been excavated and its debris carried to the ocean, I confidently infer from the following remarkable fact.

At the base of the wall, and within a few rods of it, and on the very ground where the Indians dig for the red stone, rests a group of five stupendous boulders of gneiss leaning against each other, the smallest of which is twelve or fifteen feet, and the largest twenty-five feet in diameter, weighing, unquestionably, several hundred tons. These blocks are composed chiefly of feldspar and mica, of an exceedingly coarse grain (the feldspar often occurring in crystals of an inch in diameter). The surface of these boulders is in every part covered with a gray moss, which gives them an extremely ancient and venerable appearance, while their sides and angles are rounded by attrition to the shape and character of most other erratic stones which are found throughout the country.

That these five immense blocks, of precisely the same character, and differing materially from all other specimens of boulders which I have seen in the great valleys of the Mississippi and Missouri, should have been hurled some hundreds of miles from their native bed, and lodged in so singular a group on this elevated ridge, is truly matter of surprise for the scientific world, as well as for the poor Indian, whose superstitous veneration for them is such that not a spear of grass is broken or bent by his feet within three or four rods of the group; where he stops, and in humble supplication, by throwing plugs of tobacco to them, solicits their permission (as the guardian spirit of the place) to dig and carry away the red stone for his pipes. The surface of the boulders I found in every part entire and unscratched by anything, and even the moss was everywhere unbroken, which undoubtedly remains so at this time, except where I applied the hammer to obtain some small specimens, which I brought away with me.*

The fact alone that these blocks differ in character from all other specimens which I have seen in my travels, amongst the thousands of boulders which are strewed over the great valley of the Missouri and Mississippi, from the Yellowstone almost to the gulf of Mexico, raises in my mind an unanswerable question as regards the location of their native bed, and the means by which they have reached their isolated position like five brothers, leaning against and supporting each other, without the existence of another boulder of any description within fifty miles of them. There are thousands and tens of thousands of boulders scattered over the prairies, at the base of the Coteau on either side, and so throughout the valley of the St. Peter's and Mississippi, which are also subjects of very great interest and importance to science, inasmuch as they present to the world a vast variety of characters, and each one, although strayed from its original position, bears incontestible proof of the character of its native bed. The tract of country lying between the

* In a specimen with which we are favored by Mr. Catlin, the feldspar is in distinct crystals, is tinted red, and greatly abounds; the quartz is gray and white, and the mica black, while the moss covers nearly half the mass.—*Eds.*

1837, Catlin.]

St. Peter's river and the Coteau, over which we passed, presents innumerable specimens of the kind, and near the base of the Coteau, they are strewed over the prairie in countless numbers, presenting almost an incredible variety of rich and beautiful colors, and undoubtedly traceable (if they *can* be traced,) to separate and distinct beds. Amongst these beautiful groups it was sometimes a very easy matter to sit on my horse and count within my sight some twenty or thirty different varieties of quartz and granite in rounded boulders, of every hue and color, from snow white to intense red and yellow and blue, and almost to a jet black, each one well characterized and evidently from a distinct quarry. With the beautiful hues and almost endless characters of these blocks, I became completely surprised and charmed, and I resolved to procure specimens of every variety, which I did with success by dismounting from my horse and breaking small bits from them with my hammer, until I had something like a hundred different varieties containing all the tints and colors of the painter's pallet. These I at length threw away, as I had on several former occasions other minerals and fossils, which I had collected and lugged along from day to day, and sometimes from week to week.

Whether these varieties of quartz and granite can all be traced to their native beds, or whether they all have originals at this time exposed above the earth's surface, are generally matters of much doubt in my mind. I believe that the geologist may take the varieties which he may gather at the base of the Coteau in one hour, and travel the continent of North America all over without being able to put them all in place; coming at last to the unavoidable conclusion that numerous chains or beds of primitive rocks have reared their heads on this continent, the summits of which have been swept away by the force of the diluvial currents; and their fragments jostled together and strewed about, like foreigners in a strange land, over the great valleys of the Mississippi and Missouri, where they will ever remain and be gazed upon by the traveler as the only remaining evidence of their native ledges, which have again been submerged or covered with diluvial deposits.

There seems not to be, either on the Coteau, or in the great valleys on either side, so far as I have traveled, any slaty or other formation exposed above the surface, on which grooves or scratches can be seen, to establish the direction of the diluvial currents in those regions; yet I think the fact is pretty clearly established by the general shapes of the valleys, and the courses of the mountain ridges which wall them in on their sides.

The Coteau des Prairies is the dividing ridge between the St. Peter's and the Missouri rivers; its southern termination or slope is about in the latitude of the falls of St. Anthony, and it stands equi-distant between the two rivers, its general course bearing two or three degrees west of north, for the distance of two or three hundred miles, when it gradually slopes again to the north, throwing out from its base the headwaters and tributaries of the St. Peter's on the east; the Red river and other streams which empty into the Hudson's bay on the north; "La Riviere Jacques" and several tributaries to the Missouri on the west; and the Red Cedar, the Ioway and the Des Moines on the south.

This wonderful anomaly in nature, which is several hundred miles in length, and varying from fifty to an hundred in width, is undoubtedly the noblest mound of its kind in the world. It gradually and gracefully rises on each side, by swell after swell, without tree, or bush, or rocks (save what are to be seen at the pipestone quarry), and is everywhere covered with green grass, affording the traveler, from its highest elevations, the most unbounded and sublime views of—nothing at all, save the blue and boundless ocean of prairies that lie beneath and all around him, vanishing into azure in the distance, without a speck or spot to break their softness.

The direction of this ridge clearly establishes the course of the diluvial current in this region, and the erratic stones which are distributed along the base I attribute to an origin several hundred miles northwest from the Coteau. I have not myself traced the Coteau to its highest points, nor to its northern extremity, but on this subject I have closely questioned a number of travelers who have traversed every mile of it with their carts, and from thence to lake Winnipec on the north, who uniformly tell me that there is no range of primitive rocks to be crossed in traveling the whole distance, which is one connected and continuous prairie.

The surface of the sides and the top of the Coteau is everywhere strewed over with granitic sand and pebbles, which, together with the fact of five boulders resting at the pipestone quarry, shows clearly that every part of the ridge has been subject to the action of these currents, which could not have run counter to it without having disfigured or deranged its beautiful symmetry.

The glazed or polished surface of the quartz rocks at the pipestone quarry, I consider a very interesting subject, and one which will hereafter produce a variety of theories as to the manner in which it has been formed and the causes which have led to such singular results. The quartz is of a close grain and exceedingly hard, eliciting the most brilliant sparks from steel, and in most places where it is exposed to the sun and air, its surface has a high polish, entirely beyond any result which could have been produced by diluvial action, being perfectly glazed as if by ignition. I was not sufficiently particular in my examination to ascertain whether any parts of the surface of these rocks under the ground, and not exposed to the action of the air, were thus affected, which would afford an important argument in forming a correct theory with regard to it; and it may also be a fact of similar importance that the polish does not extend over the whole wall or area, but is distributed over it in sections, often disappearing suddenly and reappearing again, even where the character and exposure of the rock are the same and unbroken. In general, the points and parts most projecting and exposed, bear the highest polish; which would naturally be the case, whether it was produced by ignition or by the action of the air and sun. It would seem almost an impossibility that the air in passing these projections for centuries, could have produced so high a polish on so hard a substance, and, in the total absence of all igneous matter, it seems equally unaccountable that this effect could have been produced by fire. I have broken off specimens and brought them home, which have as high a polish and luster on the surface as a piece of melted glass; and then as these rocks have certainly been formed where they now lie, it must be admitted that this strange effect has been produced either by the action of the air or by igneous influence, and if by the latter cause, we can come to no other conclusion than that these results are volcanic;* that this wall has once formed the side of an extinguished crater, and that the pipestone, lying in horizontal strata, was formed by the lava which issued from it. I am strongly inclined to believe, however, that the former supposition is the correct one, and that the pipestone, which differs from all known specimens of lava and steatite, will prove to be a subject of great interest, and worthy of careful analysis.

The first plate-page is designed to show at a glance the history of geographical exploration in Minnesota, from the time of the earliest French exploration to the date of Catlin's visit to the pipestone quarry. Plate-page No. 2 is a reduced copy of Franquelin's map of 1688, being the oldest known map of the region west of lake Superior.

LIEUT. ALBERT M. LEA ON THE BLACK HAWK PURCHASE.

Lieut. A. M. Lea's map, accompanying his report on the "Black Hawk purchase," entitled "Notes on the Iowa District of Wisconsin Territory," 1836, shows the southern and southeastern counties of Minnesota, and the tributaries of the Mississippi river as far north as the foot of lake Pepin. The Whitewater river, by this map, joins the Embarras river just before the latter reaches the Mississippi. A tributary of the Whitewater from the south is named Swallow creek. Lake Albert Lea is there styled Fox lake. Fountain lake he styled Chapeau lake. A branch of the Blue Earth river is represented, and Council lake as one of its tributaries. This is probably Walnut lake, of Faribault county. The head of Lime creek is

*These smoothed surfaces are due to the polishing effect of sand and dust driven by the high winds.—N. H. W.


SALT WATER REGION
SALT WATER REGION
YANKTON
COUNTRY
YANKTON
COUNTRY
COTEAU DU MISSOURI
RED RIVER OF THE NORTH
RED LAKE
CHIPEWAY COUNTRY
HEIGHT OF LAND
MISSABAY HEIGHTS
REGION OF ROCKS AND WATER
HUNTERS ISLAND
KICHI GUMMI
LAKE SUPERIOR
ISLE ROYALE
TWELVE APOSTLES ISLANDS
CHIPEWAY COUNTRY
COTEAU DU GRAND BOIS
PLATEAU DU COTEAU DES PR
M'DEWAKANTON COUNTRY
WARPETON COUNTRY
SISSITON COUNTRY
WARPEKUTEY COUNTRY
UNDINE REGION
WISCONSIN TERRITORY
WINEBAGO INDIAN COUNTRY
MISSOURI RIVER
BIG STONE L.
ST. CROIX LAKE
Fort Snelling

Trail lake, with a smaller one flowing into it from the northwest. Northwest from Chapeau lake, and between its two affluents from the northwest is "Paradise Prairie." A "trading house" is represented at Red Wing's village, at the foot of lake Pepin. Lieut. Lea's brief general notes pertain wholly to the region south of Minnesota, though his return trail passes through our southern counties.

JEAN N. NICOLLET.

From 1836 to 1843, Mr. Jean N. Nicollet prosecuted the geographical exploration of the upper Mississippi. He died while his report, intended to show the result of his labors, was undergoing print and revision.* It is accompanied by a map, which, up to that time, was the most complete and correct of the upper Mississippi region. It covered not only the whole of Minnesota but also Iowa, about one-half of Missouri and much of Dakota, Wisconsin and Illinois. It has been pronounced by high authority† "one of the greatest contributions ever made to American geography." That part of his map covering Minnesota, where the greater part of his time was spent, and where he brought out the most interesting and matured results, is reproduced in plate-page No. 7. He not only expresses the names of streams and lakes, but gives the first representation of the striking topographical features of the western and northern portions of the state. Without any just idea of the origin of the immense "erratic deposite" which characterizes the western and northern part of the state, he has, with tolerable correctness, delineated the course of a series of knolls and hills, made up of drift, under the names, *Plateau du Coteau des Prairies, Coteau du Grand Bois, Hight of Land, Missabay Hights,* which extend through Minnesota and mark the continuous limit of the ice-sheet at the time of the last glacial epoch. He aims to locate correctly, by astronomical observations, the numerous streams and lakes, and the main geographical features of the state, filling in by eye-sketching, and by pacing, the intermediate objects. His methods, allowing for the imperfection of his appliances, and the meagerness of his outfit and supplies, were established on the same principles as the most approved geodetic surveys of the present day. It would, perhaps, have been

*Report intended to illustrate a Map of the Hydrographical Basin of the Upper Mississippi river, made by J. N. Nicollet, while in employ under the Bureau of the Corps of Topographical Engineers. Feb. 16, 1841, Washington. Senate document No. 237. 26th Congress, 2d Session.

†Gen. G. K. Warren, Pac. R. R. Reports. Vol. XI., p. 41.

well if the methods of Nicollet could have been adhered to in the further surveying and mapping of the western territories. Their geography would have been less rapidly developed, but it would have been done more correctly. Nicollet's map embraces a multitude of names, including many new ones, which he applied to lakes and streams. These are not represented on the general historical map, but may be seen on referring to Nicollet's map as reproduced.

Mr. Nicollet makes but few references to the geology and natural history of the region he surveyed, his main purpose being geographical information. Lieut. J. C. Fremont was his principal aid. He also employed Mr. Charles Geyer as a practical botanist, whose collections were named by Prof. John Torrey. His fossils were named by himself, or by the assistance of Vanuxem and Conrad of the New York Geological Survey, then lately instituted.

MR. NICOLLET ON THE COTEAU DES PRAIRIES.

The basin of the upper Mississippi is separated in a great part of its extent from that of the Missouri, by an elevated plain, the appearance of which, seen from the plain of the St. Peter's, or that of the river Jacques, *looming as it were a distant shore*, has suggested for it the name of *Coteau des Prairies*. Its more appropriate designation would be that of *plateau*, which means something more than is conveyed to the mind by the expression, *a plain*.

Its northern extremity is in latitude 46°, extending to 43°; after which it loses its distinctive elevation above the surrounding plains, and passes into rolling prairies. Its length is about two hundred miles, and its general direction N. N. W. and S. S. E. Its northern termination, (called *Tete du Coteau*, in consequence of its peculiar configuration,) is not more than fifteen to twenty miles across; its elevation above the level of the Big Stone lake is 890 feet, and above the ocean 1916 feet. Starting from this extremity (that is, the head of the Coteau,) the surface of the plateau is undulating, forming many dividing ridges which separate the waters flowing into the St. Peter's and the Mississippi from those of the Missouri.

Under the forty-fourth degree of latitude, the breadth of the Coteau is about forty miles, and its mean elevation is here reduced to 1450 feet above the sea. Within this space its two slopes are rather abrupt, crowned with verdure and scolloped by deep ravines thickly shaded with bushes, forming the beds of rivulets that water the subjacent plains.

The Coteau itself is isolated, in the midst of boundless and fertile prairies, extending to the west, to the north, and into the valley of the St. Peter's.

The plain at its northern extremity is a most beautiful tract of land, diversified by hills, dales, woodlands and lakes, the last abounding in fish. This region of country is probably the most elevated between the gulf of Mexico and Hudson's bay. From its summit, proceeding from its western to its eastern limits, grand views are afforded. At its eastern border, particularly, the prospect is magnificent beyond description, extending over the immense green turf that forms the basin of the Red river of the North, the forest-capped summits of the *hauteurs des terres* that surround the sources of the Mississippi, the granitic valley of the upper St. Peter's, and the depressions in which are lake Traverse and the Big Stone lake. There can be no doubt that in future times this region will be the summer resort of the wealthy of the land. * * *

The other portions of the Coteau, ascending from the lower latitudes, present pretty much the same characters. This difference, however, is remarkable: that the woodlands become

1838, Nicollet.]

scarcer, whilst the open prairies increase in extent. It is very rarely only that groves are met with, to which the *Ndakotahs*, or Sioux, have given the name of *Tchan Witah*, or Wood islands. When these groves are surrounded by water they assume some resemblance to oases, and hence I have assigned this name to some of them on my map.

These oases, possessed of a good soil, well wooded, offering an abundance of game, and waters teeming with fish, offer inducements for permanent settlements. In this region there are frequent instances of a marsh, or lake, furnishing waters to different hydrographical basins—a fact observed by the Sioux, and which they express, in the compound word of their dialect, *mini akipan kaduza;* from *mini*, water, *akipan*, division, share, and *kaduza*, to flow, to run out.

There are, besides, other fine lakes, that would furnish, on their borders, eligible sites for such villages as were formerly occupied by some of the *Ndakotah* tribes, previous to the war of extermination waged against them by the Sac and Fox Indians. Among them may be numbered the series of lakes designated as the Shetek, Benton, Titan-kahi, Poinsett, Abert, Spirit, and Tizaptonan lakes.

Whatever people may fix their abode in this region must, necessarily, become agriculturists and shepherds, drawing all their resources from the soil. They must not only raise the usual agricultural products for feeding, as is now but too generally done in some parts of the west, but they will have to turn their attention to other rural occupations, such as tending sheep for their wool; which would greatly add to their resources, as well as finally bring about a more extended application of the industrial arts among them. * * * * * The plateau of the Coteau des Prairies is composed in a great measure, of the materials belonging to what I have named the *erratic deposite*, as is evidenced by the nature of the soils, the physiognomy of the ridges and hillocks that diversify its surface, the deep ravines by which it is flanked, and the innumerable erratic blocks strewed over the borders of its lakes.

We have no data by which to determine the inferior limits of this deposite; still there is reason to think that it rests upon such primary rocks as show themselves along the line of rapids of the upper St. Peter's, consisting of granite, sienite and other metamorphic rocks. Nevertheless, over the vast extent of this plateau, there is, apparently, but one spot where the subjacent rock makes its appearance, and this is at the Indian red pipestone quarry, so-called.

NICOLLET AT THE RED PIPESTONE QUARRY.

The Indians of all the surrounding nations make a regular annual pilgrimage to it unless prevented by their wars or dissensions. The quarry is on the lands of the Sissiton tribe of Sioux.

The idea of the young Indians, who are very fond of the marvellous, is, that it has been opened by the Great Spirit, and that whenever it is visited by them, they are saluted by lightning and thunder. We may cite as a coincidence, our own experience in confirmation of this tradition. Short of half a mile from the valley, we were met by a severe thunder-storm, during which the wind blew with so much force as to threaten the overthrowing of Mr. Renville's wagon; and we were obliged to stop for a few minutes during the short descent into the valley.

If this mode of reception was at first to be interpreted as an indication of anger on the part of the Great Spirit for our intrusion, we may add that he was soon reconciled to our presence; for the sun soon after made his appearance, drying both the valley and our baggage. The rest of the day was spent in pitching our tent on the supposed consecrated ground, and in admiring the beautiful effects of lights and shadows produced by the western sun as it illumined the several parts of the bluff, composed of red rock of different shades, extending a league in length, and presenting the appearance of the ruins of some ancient city built of marble and porphyry. The night was calm and temperate, of which we took advantage to make astronomical observations.

* * * * * * * * * *

The valley of the "Red Pipestone" extends from N. N. W. to S. S. E. in the form of an ellipsis, being about three miles in length, with a breadth at its smaller axis of half a mile. It is cradle-shaped, and its slope to the east is a smooth sward, without trees and without rocks. Its slope to the west is rugged, presenting a surface of rocks throughout its whole length, that form a very picturesque appearance, and would deserve a special description if this were the place to do so. But I am now more particularly interested in defining its geological features.

The principal rock that strikes the attention of the observer in this remarkable inland bluff, is an indurated (metamorphic) sandrock, or quartzyte, the red color of which diminishes in intensity from the base to the summit. It is distinctly stratified; the upper beds being very much weather-worn and disintegrated into large and small cubic fragments.

The whole thickness of this quartzyte, which immediately overlies the bed of the red pipestone is 26½ feet. Its strata appear to have a small dip to the N. E. The floor of the valley, which is higher than the red pipestone, is formed by the inferior strata of the quartzyte, and in the spring of the year is most generally under water; the action of which upon the rock is apparent in the great quantity of fragments strewed over the valley, so as to render it uncomfortable to walk over them. The creek by which the valley is drained, feeds in its course three distinct small basins at different elevations, that penetrate down as far as the red pipestone.

This red pipestone, not more interesting to the Indian than it is to the man of science, by its unique character, deserves a particular description. In the quarry of it which I had opened, the thickness of the bed is one foot and a half; the upper portion of which separates in thin slabs, whilst the lower ones are more compact. As a mineralogical species it may be described as follows: compact; structure slaty; receiving a dull polish; having a red streak; color blood-red, with dots of a fainter shade of the same color; fracture rough; sectile; feel somewhat greasy; hardness not yielding to the nail; not scratched by selenite, but easily by calcareous spar; specific gravity 2.90. The acids have no action upon it; before the blowpipe it is infusible *per se*, but with borax gives a green glass.

According to Prof. Jackson, of Boston, who has analyzed and applied to it the name of catlinite, after Mr. Catlin, it is composed of—

Water	8.4
Silica	48.2
Alumina	28.2
Magnesia	6.0
Peroxide of iron	5.0
Oxide of Manganese	0.6
Carbonate of lime	2.6
Loss (probably magnesia)	1.0
Total	100.0

But Prof. Jackson assimilates it to the agalmatolite, from which it differs, however, very materially by its general aspect, its conduct before the blowpipe, and its total insolubility in sulphuric acid.*

Another feature of the Red Pipestone valley is the occurrence of granitic boulders of larger size than any I had previously met. One of these measured about sixty feet in circumference, and was from ten to twelve feet thick. They are strewed over the valley, in which it is remarkable that there are no pebbles.

The name of Mr. Nicollet, and the initials of his companions, are handsomely cut in the hard quartzyte at the top of the ledge near the Leaping Rock, a little north of where the creek passes over the brow of the escarpment, as here represented and arranged, viz:

J. N. Nicollet.
C. F.
C. A. G.
J. L.
J. E. F.
J. R.

Expedition July, 38.

*The red pipestone is also found on the upper part of the Mishkwagokag, or Red Cedar river, which falls into the Chippeway river that empties itself into the Mississippi river below lake Pepin.

1838, Nicollet.]

THE UNDINE REGION.

I shall now proceed to give a short account of some of the regions of country adjoining the Coteau des Prairies, omitting those which have already found a place in the geography of the United States, so as to be more particular concerning such as are but little or not at all known. Among these, that which appeared to me the most favorable, is the one watered by the bold Mankato or Blue Earth river, and to which I have given the name of *Undine region*.

The great number of the navigable tributaries of the Mankato, spreading themselves out in the shape of a fan; the group of lakes surrounded by well-wooded hills; some wide-spreading prairies with fertile soil; others apparently less favored, but open to improvement;—the whole together bestow upon this region a most picturesque appearance. It was while on a visit to lakes *Okamanpidan* and *Tchanhassan* (Little Heron and Maplewood lakes), that it occurred to me to give it the name that I have adopted, derived from that of an interesting and romantic German tale, the heroine of which belonged to the extensive race of water-spirits living in the brooks and rivers and lakes, whose father was a mighty prince. She was, moreover, the niece of a great brook (the Mankato) who lived in the midst of forests, and was beloved by all the many great streams of the surrounding country, etc., etc.

I do not know why I fancied an analogy between the ideal country described in the tale, and that of the one before me; but I involuntarily, as it were, adopted the name.*

The limit of this region is the N. E. prong of the Coteau des Prairies, which takes in the sources of the Mankato and of the La Hontan rivers, subdividing itself into undulations whence proceed the waters of the *Wazioju*, or Pine river, *Miniska*, or White Water river, *Okah*, or Heron run, &c., &c., all emptying into the Mississippi.

The Mankato becomes navigable with boats within a few miles of its sources. It is deep, with a moderate current along a great portion of its course, but becomes very rapid on its approach to the St. Peter's. Its bed is narrowly walled up by banks rising to an elevation of from sixty to eighty feet, and reaching up to the uplands through which the river flows. These banks are frequently cliffs, or vertical escarpments, such as the one called by the Sioux *Manya kichaksa*, or cleft elevation. The breadth of the river is pretty uniformly from 80 to 120 feet wide; and the average breadth of the valley through which it flows scarcely a quarter of a mile. The latter, as well as the high grounds, are well-wooded; the timber beginning to spread out on both shores, especially since they have become less frequented by the Sioux hunters, and are not so often fired. But the crossings of the river are hard to find, requiring to be pointed out by an experienced guide. I have laid down on the map my route over the Undine region, and the geographical positions of the crossing places will be found in the table at the end of the report.

On the left bank of the Mankato, six miles from its mouth, in a rocky bluff composed of sandstone and limestone, are found cavitives in which the famed blue or green earth, used by the Sioux as their principal pigment, is obtained. This material is nearly exhausted, and it is not likely that this is the spot where a Mr. Le Sueur (who is mentioned in the narrative of Major Long's Second Expedition, as also by Mr. Featherstonhaugh) could, in his third voyage during the year 1700, have collected his four thousand pounds of copper earth sent by him to France. I have reason to believe that Le Sueur's location is on the river to which I have affixed his name, and which empties into the Mankato three quarters of a league above Fort L'Huillier, built by him, and where he spent a winter.

This location corresponds precisely with that given by Charlevoix, while it is totally inapplicable to the former. Here the blue earth is abundant in the steep and elevated hills at the mouth of this river, which hills form a broken country on the right side of the Mankato. Mr. Fremont and myself have verified this fact—he during his visit to Le Sueur river; and I upon the locality designated by Mr. Featherstonhaugh, where the Ndakotahs formerly assembled in

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* The beautiful poetic conceit of Nicollet in applying the name of Undine to this region should be perpetuated. Undine was a water-sprite, that had control of the waters so as to accomplish her designs. Her uncle, Kuhleborn, who possessed a great stream, was influential over many, and caused sudden floods to stop travel, and to intercept fugitives. His passage from province to province was often subterranean, and brought him into numerous lakes. He made his realm obedient to Undine, and aided her ambitious design to captivate a rich and noble knight. The story is one of the eighteenth century, written by Fouque. The multiplicity of streams, springs, and lakes in this region, with occasional subterranean channels (see *Geology of Blue Earth County*,) greatly in contrast with the monotonous, treeless prairies on either side, make it an image of the domain of Kuhleborn, and suggest that it is the habitation of Undine, and her associate water-nymphs. The valleys, and some of the uplands, in this region, are wooded and the streams sometimes run in deep, rock-bound gorges.

great numbers to collect it, but to which they now seldom resort, as it is now comparatively scarce—at least so I was told by *Sleepy Eye*, the chief of the *Sissitons*, who accompanied me during this excursion.

As I did in the case of the red pipestone described above, I will state the mineralogical character of the Indian blue earth or clay. It is massive, somewhat plastic, emits an argillaceous odor when breathed upon; color bluish green; easily scratched with the nail, when formed into hardened balls. The acids have no action upon it; it is infusible before the blowpipe, but loses its color and becomes brown. This color is due to the peroxide of iron which it contains in the proportion of ten per cent. at least. It contains no potash and but a small proportion of lime. It is a very different mineral from that described by Dr. Thompson under the name of pipe-clay.

Next comes the region of country between the St. Peter's and the upper portions of La Hontan and Le Sueur rivers, above referred to. This is an extensive district, thickly set in forests amidst which there are reported to be many large lakes. The French give to the forests the name of *Bois-francs*, or *Bois-forts*, whenever they are not composed principally of trees belonging to the family of the *Coniferæ*.

To complete an account of the physical geography of the country, including the Undine region with the last mentioned, I will now enumerate some of the most important trees, shrubs and plants that characterize its *sylva* and *flora*.

The whole country embraced by the lower St. Peter's and the Undine region exceeds any land of the Mississippi above Wisconsin river, as well in the quality and quantity of its timber as the fertility of its soil. The forests of the valley on the right bank are connected by groves and small wooded streams of the adjoining prairies with the forest called *Bois francs*, and they extend so far southwest as to include the lands of the upper waters of the Mankato river.

The forest trees, as reported to me by Mr. Geyer, are chiefly soft maple, American and red elm, black walnut, the nettle tree, basswood, red and white ash; the undergrowth, the common hawthorn, prickly ash, high cranberry, red root, gray dogwood, fox grapes, horse-briar and moon-seed. Among the herbs are the wild and bristly sarsaparilla, Indian turnip, the gay orchis and others; rushes and the flowering ferns are abundant along the low banks of the rivers. The valley prairies are rich in pasture grasses and leguminous and orchideous plants, such as the yellow lady's slipper, American and tufted vetch, and others. The lowest parts near the borders of the woods, and those subject to inundations, are filled with the high weeds common to such places—as the ragged cup, tall thistle, great bitterweed, the tuberous sunflower, and others.

Swamps are frequent, and some of them contain extensive tracts of tamarack pines. Cedars grow, intermixed with red birch, on the rocky declivities of the lower Mankato river. Red and bur oak, with hazel, red-root, peter's-wort, and the wild rose, are the trees and shrubs of the uplands. There are, besides, thickets of the poplar birch that are frequent in the elevated prairies near the river. The prairies are very luxuriant, and generally somewhat level and depressed; the gum-plant and button snake-root are their most abundant and conspicuous herbs.

To give animation to the Undine region, and to the valley of the St. Peter's, as well as to develop trade between the British possessions, the territory of Iowa and the state of Missouri, it would be necessary for government to open routes of communication between St. Peter's and the Travese des Sioux, through the *Bois francs* mentioned above; between St. Peter's and the Prairie du Chien; between Dubuque and the Lac-qui-parle; through the Undine region, with a fork in the direction of the Traverse des Sioux, passing by Fremont* and *Okoman*† lakes, (which latter is at the headwaters of La Hontan river,) and in other directions that would naturally suggest themselves.

The geological formation that characterizes the Undine region as well as the St. Peter's, as far nearly as the mouth of the *Waraju*, is the same as that of Fort Snelling which I shall describe further on. It consists mainly in a thick stratum of friable sandstone as the basis, succeeded by a deposite of limestone, which is sometimes magnesian, and occasionally contains fossils; the whole covered by what I have called the erratic deposite.

The sandstone forms the Little rapids of the St. Peter's, and, reappearing at the Traverse des Sioux, determines other rapids that are observed in a beautiful stream‡ two miles northeast of

* Probably Clear Lake, near Waseca.
† Lake Elysian.
‡ Moon creek, now called Cherry creek, at Ottawa.

the trading-post in this place. At other intermediate localities the sandstone and limestone both appear; but further on the limestone disappears altogether; because it goes thinning out as the western limits of the formation are approached. This may be observed near the Waraju, and toward the upper parts of the Mankato, where the limestone, and indeed the sandstone, are replaced by beds of clay or of calcareous marl.

In the argillaceous deposits last referred to there are red ochre, other ferruginous minerals, and lignites. Between the sandstone and the limestone there is a bed of whitish clay, enclosing nodules of the blue earth; and sometimes, between the strata of limestone, bands of argillaceous iron ore, intermixed with siliceous and calcareous incrustions.

The account given above applies equally to the rocky cliffs on the upper part of the La Hontan river, and especially to the interesting locality* at the entrance of its south fork, which is four miles to the east of lake *Ti-tanka-tanninan*.†

LA HONTAN'S RIVIERE LONGUE.

Those who have read the travels of Baron La Hontan, in which he mentions his discovery of a certain long river coming from the west, and falling into the Mississippi, may, perhaps, think that, by giving his name to a river upon my map, I meant to clear up the doubt which has existed, for more than 150 years, as regards the veracity of this officer.

Such was not originally my intention; but I am forced into it after terminating my exploration of the Undine region. Having afterward procured a copy of La Hontan's book, in which there is a roughly made map of his Long river, I was struck with the resemblance of its course, as laid down, with that of Cannon river; which I had previously sketched in my own field-book. I soon convinced myself that the principal statements of the Baron, in reference to the country, and the few details he gives of the physical character of the river, coincided remarkably with what I had laid down as belonging to the Cannon river.

Thus the lakes and swamps corresponded; traces of Indian villages mentioned by him might be found in the growth of a certain grass that propagates itself around all old Indian settlements. Some of the names which he assigns to them may be referred to dialects of the Sioux tongue; and even his account of the feasting of his men on the large number of the American hare which he found there, is substantiated by the voyageurs.

His account, too, of the mouth of the river, is particularly accurate. The most scrupulous geographer, describing it at this time, would have but little to alter. As this locality is in the way of travelers going to St. Peter's, I will quote from the text of La Hontan, so that they may judge of the truth of my assertion. "We entered," he says, "the mouth of this long river, which is a sort of large lake filled with canebrakes (*joncs*); in the midst of which we discovered a narrow channel, which we followed up," &c.

I do not pretend, however, to justify his gross exaggeration of the length of the river; of the numerous population on its banks; and his pretended information respecting the nations inhabiting the more remote regions. This sort of exaggeration seems to have belonged to the period; but there is apparently a more serious objection to be made to his narrative—namely, that it appears, from his text, he traveled during the months of November and December; at which period of the year the rivers in these parts are mostly frozen over, and the voyage therefore impracticable. But the received opinion, on the other hand, is, that it is one of the last to freeze, and is the last resort of the wild fowl. The Sioux are said to congregate, in consequence upon its banks in large numbers; relying on this resource, whilst they are otherwise collecting their peltries, insomuch that the American Fur Department at St. Peter's has always kept up this post for the purpose of securing the advantages of this trade. Besides, this river is fed by a great number of springs; and the upper portion of its course is in a remarkable manner protected from sudden changes of temperature by high rocky banks and thick forests that cover them.

Under all these circumstances I have thought proper to notice these facts, that seem to possess sufficient interest in the history of the geography of the west; I have stated what appeared to me the true facts in the case; and I may add, in conclusion, that if La Hontan's claims to discoveries are mere fables, he has had the good fortune or the sagacity to have come near the truth.

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* The vicinity of Faribault.

† Cannon lake, in Rice county.

Further, in reference to La Hontan river: when the French were in possession of the country it was known by the name *Riviere aux Canots* or Canoe river, as it was there that the traders were in the habit of concealing their canoes. Its present name of Cannon river is evidently a corruption of the French one. The one which it bore among the Sioux in 1700, when Le Sueur ascended the Mississippi (and which it still bears) was *Inyan-bosndata*, or Standing Rock.

CASTLE ROCK, LONE ROCK AND CHIMNEY ROCK.

This Indian name (*Inyan-bosndata*) is that of a natural obelisk which occurs on a low and sandy plain four miles to the north of the crossing place, on the "north fork of La Hontan river."* This heap of disintegrated sandstone rock is thirty-six feet high. It is a curious specimen of the weathering of the sandstone of the west, that may be compared to the earth pillars left behind by workmen to mark the extent of their excavations, and is possibly a relic of the thickness of the formation previous to the devastating agency of the elements, that has altered the original level of the surface of the country. My friend, the Viscomte de Montmort (then an attaché to the French legation at Washington, who accompanied me in this excursion), has furnished me with an admirable drawing of it, as well as of the natural monument next to be mentioned.

Twelve miles north of the natural obelisk which I have just described, near the crossing place of the Vermilion river, there are other evidences† of the great denudation of the surface that has taken place in this region. One of them is also remarkable by its symmetrical outlines, bearing the appearance of a dilapidated castle of feudal times, such as are seen in the Alps and other places; hence its name. I have thought it of sufficient importance to indicate their situations on my map. These natural monuments are mentioned by Mr. Featherstonhaugh upon information received from others, but he did not visit them.

THE DES MOINES CONNECTED WITH THE MINNESOTA.

Mr. Nicollet called attention to the hydrographical relations of the Des Moines river with the Blue Earth, the Minnesota and the Mississippi rivers. The point of geographical interest is found in latitude 43° 45′, longitude 95° 12′, where there is a lake very near the Des Moines, called *Tchan shetcha* or Dry Wood lake. The Blue Earth river, by means of its tributary, the Watonwan, has one of its sources in this lake, and the land separating it from the Des Moines is not more than a mile or a mile and a half in width. Thus a short canal would bring the Des Moines into communication with the Minnesota. This interesting fact was formerly taken advantage of by the Indian fur traders, who, after spending the winter on the headwaters of the Des Moines, found it convenient to bring their peltries by water communication through the Watonwan valley and the Blue Earth to the mouth of the Minnesota river.

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* Chub creek, in Dakota county.
† Lone rock and Chimney rock.

1836, Nicollet.]

NICOLLET ASCENDS THE MISSISSIPPI.

In July, 1836, Mr. Nicollet ascended the Mississippi to its source in Itasca lake. He says that above the falls of St. Anthony the rocky formations assume another type, "being the several varieties of greenstone, and finally passing into talcose slate," as seen at the falls of the *Wabezi*, or Swan river, and the *Omoshkos*, or Elk river. Along with Schoolcraft, he mentions, among other trees, the walnut, as one of those native to the Mississippi valley above the falls of St. Anthony. He mentions, as a prominent geological feature of the country, the outcrop of syenitic rock on the east side of the river, a little below the *Pikwabik*, with a flesh-colored feldspar, extending a mile in length, with a breadth of half a mile, and an elevation of eighty feet, known as *little rock*.* At the foot of Knife rapids,† higher up, on the same side of the river, "there are sources that transport a very fine, brilliant and bluish sand, accompanied by a soft and unctuous matter. This appears to be the result of a decomposition of a steaschist, probably interposed between the sienitic rocks previously mentioned. The same thing is observed at the mouths of *Wabezi* and *Omoshkos*." From Crow Wing river Mr. Nicollet pursued a new route to Itasca lake. At a distance of three miles from its mouth he ascended *Gayashk*, or Gull river, and the lake having the same name. Then portaging northeast, he reached Pine river and visited Whitefish lake. Ascending the east fork of Pine river, he reached *Kwiwisens*, or Little Boy river. This he descended through a succession of lakes and over small rapids, as far as Leech lake, where he spent a week, and was befriended from the Indians in an emergency, by Rev. Mr. Boutwell, who had accompanied Mr. Schoolcraft in 1832. From Leech lake he passed westward, through lake *Kabekonang* and *Kabekonang* river, and made a portage of five miles to the La Place river, which is the same that Mr. Schoolcraft called the *East Fork of the Mississippi*, in 1832. He ascended this to lake Assawa, where he found an old camp of Mr. Schoolcraft. The last portage, one of six miles, to Itasca lake, was found to be very arduous, being across numerous sloughs, with low intervening ridges. The soil was found to be sandy and gravelly, overspread with erratic blocks, with a great variety of evergreens. The last of the series of ridges, being also the highest, is 120 feet above the waters of lake Itasca.

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* The same as Schoolcraft's *peace rock*, situated in Sec 27, Watab, Benton county.
† Pike Rapids.

NICOLLET AT THE SOURCE OF THE MISSISSIPPI.

The Mississippi holds its own from its very origin; for it is not necessary to suppose, as has been done, that lake Itasca may be supplied with invisible sources, to justify the character of a remarkable stream, which it assumes at its issue from this lake. There are five creeks that fall into it, formed by innumerable streamlets oozing from the clay-beds at the bases of the hills, that consist of an accumulation of sand, gravel and clay, intermixed with erratic fragments; being a more prominent portion of the erratic deposite previously described, and which here is known by the name of *Hauteurs des Terres*, hights of land.

These elevations are commonly flat at top, varying in hight from eighty-five to one hundred feet above the level of the surrounding waters. They are covered with thick forests in which the coniferous plants predominate. South of Itasca lake they form a semi-circular region, with a boggy bottom, extending to the southwest a distance of several miles; thence these *Hauteurs des Terres* ascend to the northwest and north, and then stretching to the northeast and east, through the zone between 47° and 48° of latitude, make the dividing ridge between the waters that empty into Hudson bay and those which discharge themselves into the gulf of Mexico. The principal group of these *Hauteurs des Terres* is subdivided into several ramifications, varying in extent, elevation and course, so as to determine the hydrographical basins of all the innumerable lakes and rivers that so peculiarly characterize this region of country.

One of these ramificationa extends in a southerly direction under the name *Coteau du Grand Bois;* and it is this which separates the Mississippi streams from those of the Red river of the North.

The waters supplied by the north flank of these hights of land, still on the south side of lake Itasca, give origin to the five creeks of which I have spoken above. These are the waters which I consider to be the utmost sources of the Mississippi. Those that flow from the southern side of the same hights, and empty themselves into Elbow lake, are the utmost sources of the Red river of the North; so that the most remote feeders of Hudson bay and the gulf of Mexico are closely approximated to each other.

Now, of the five creeks that empty into Itasca lake (the *Omoshkos Sagaigon*, of the Chippeways, or the *Lac a la Biche*, of the French, or the Elk lake of the British) one empties into the east bay of the lake; the four others into the west bay. I visited the whole of them; and among the latter there is one remarkable above the others, inasmuch as its course is longer and its waters more abundant; so that, in obedience to the geographical rule "that the sources of a river are those which are most distant from its mouth," this creek is truly the infant Mississippi; all others below, its feeders and tributaries.

The day on which I explored this principal creek, (Aug. 29, 1836) I judged that, at its entrance into Itasca lake, its bed was from fifteen to twenty feet wide, and the depth of water from two to three feet. I stemmed its pretty brisk current during ten or twenty minutes; but the obstructions occasioned by the fall of trees compelled us to abandon the canoe, and seek its springs on foot, along the hills. After a walk of three miles, during which we took care not to lose sight of the Mississippi, my guides informed me that it was better to descend into the trough of the valley; when, accordingly, we found numerous streamlets oozing from the bases of the hills. The temperature obtained at a great number of places, by plunging the thermometer in the mud whence these springs arose, was always between 43° 5′ and 44° 2′ Fah.; that of the air being between 63° and 70°. Having taken great pains in determining the temperature, I have a right to believe that it represents pretty accurately the mean annual temperature of the country under examination.

As a further description of these headwaters, I may add that they unite at a small distance from the hills whence they originate, and form a small lake, from which the Mississippi flows with a breadth of a foot and a half, and a depth of one foot. At no great distance, however, this rivulet, uniting itself with other streamlets, coming from other directions, supplies a second minor lake, the waters of which have already acquired a temperature of 48°. From this lake issues a rivulet, necessarily of increased importance—a cradled Hercules, giving promise of the strength of his maturity; for its velocity has increased; it transports the smaller branches of trees; it begins to form sand-bars; its bends are more decided, until it subsides again into the basin of a

third lake somewhat larger than the two preceding. Having here acquired renewed vigor, and tried its consequence upon an additional length of two or three miles, it finally empties itself into Itasca lake, which is the principal reservoir of all the sources, to which it owes all its subsequent majesty.

The stream which Messrs. Schoolcraft and Allen have designated as the East Fork of the Mississippi, and which I have named after the illustrious La Place (on which there is a lake that I have called after the celebrated translator of the *Mechanique Celeste*, Mr. Bowditch), has its source, perhaps, as distant as that to which I have exclusively perserved the name of Mississippi; but as it is less important, from having less water, I have considered it only a tributary to that to which it unites itself.

The honor of having first explored the sources of the Mississippi, and introduced a knowledge of them in physical geography, belongs to Mr. Schoolcraft and Lieut. Allen. I come only after these gentlemen; but I may be permitted to claim some merit for having completed what was wanting for a full geographical account of these sources. Moreover, I am, I believe, the first traveler, who has carried with him astronomical instruments and put them to profitable account along the whole course of the Mississippi, from its mouth to its sources.

Mr. Nicollet returned from lake Itasca by way of lake Pemidji, the Metoswa rapids, and Cass and Leech lakes, stopping again with Rev. Mr. Boutwell. Of this last lake he says that its name, both in English and Chippeway, implies that "its waters contain a remarkable number of leeches." The Pokegama falls ("rapids") are said to have a fall of nine feet in the distance of eighty yards. The rock over which the water passes is styled a gray quartzyte, seen in the banks and bed of the river. He parallelizes it with the rocks on the St. Louis river, "where are found calciferous and argillaceous steachists, conglomerates formed of quartz pebbles, and bound together by steachist, containing sulphuret of iron, and a sandstone which may be possibly referred to the 'old red sandstone.'"

THE UPPER MISSISSIPPI COUNTRY.

Over the whole route which I traversed after leaving Crow Wing river, the country has a different aspect from that which the banks of the Mississippi above the falls of St. Anthony present. The forests are denser and more varied; the soil, which is alternately sandy, gravelly, clayey and loamy, is, generally speaking, lighter, excepting on the shores of some of the larger lakes. The uplands are covered with white and yellow pines, spruce and birch, and the wet low lands by the American larch and the willow. On the slopes of sandy hills, the American aspen, the canoe birch, with a species of birch of dwarfish growth, the alder and wild rose, extend to the very margin of the river. On the borders of the larger lakes, where the soil is generally, better, we find the sugar maple, the black and bur oaks (also named over-cup white oak, but differing from the white oak), the elm, ash, lime tree, &c. Generally speaking, however, this woodland does not extend back farther than a mile from the lakes. The white cedar, the hemlock,* spruce pine, and fir, are occasionally found; but the red cedar is scarce throughout this region, and none, perhaps, is to be seen, except on islands of those lakes called by the Indians *Red Cedar lakes.* The shrubbery consists principally of the wild rose, hawthorn, and wild plum; and raspberries, blackberries, strawberries and cranberries are abundant.

The aspect of the country is greatly varied by hills, dales, copses, small prairies, and a great number of lakes; the whole of which I do not pretend to have laid down on my map. The

*The hemlock, *Abies Canadensis*, does not grow in the state of Minnesota.—N. H. W.

natural beauties of the country are, however, impressed with a character of sternness and melancholy; the silence and solitude of which are interrupted or revived only by the water-fowl that congregate about its waters to nestle amidst and fatten upon the wild rice. The naturalist, however, has still an endless field of observations, in the insect world; for everywhere life manifests itself in some form or other. It is, indeed, remarkable that the more we advance to the north (to within a certain extent, nevertheless), the more the mosquito appears to be abundant, as every voyageur knows by sad experience.

The lakes to which I have just alluded are distributed in separate groups, or are arranged in prolonged chains along the rivers, and not unfrequently attached to each other by gentle rapids. It has seemed to me that they diminish in extent, on both sides of the Mississippi, as we proceed southwardly, as far as 43° of north latitude; and this observation extends to the arctic region, commencing at Bear's lake, or Slave lake, Winnipeg lake, &c. It may be further remarked that the basins of these lakes have a sufficient depth to leave no doubt that they will remain characteristic features of the country for a long time to come. Several species of fish abound in them. The white-fish (*Corregonus albus*) is found in all the deep lakes west of the Mississippi, and indeed from lake Erie to the Polar sea. That which is taken in Leech lake is said by amateurs to be more highly flavored than even that of lake Superior, and weighs from three to ten pounds. There is another species of this white-fish, called by the Indians *tuliby* or *ottuniby* (the *Corregonus artedi*) which resembles it, but is much less esteemed. Both species furnish a wholesome and palatable food. Among the other species of fish that inhabit these waters, are the *mashkinonge*, or *mashkilonge;* the pike or jack-fish; the pickerel or gilt carp; the sucker or true carp; the perch; a species of trout called by the Chippeways *namogus*, &c., &c. These lakes, which are somewhat deep, swarm with leeches; and among the amphibious reptiles there are several species of terrapin and turtle, of which Mr. Say has described three of each kind in the appendix to the second expedition of Major Long.

FOSSILS COLLECTED BY MR. NICOLLET.

Appendix C of Mr. Nicollet's report contains names of fossils collected at different points in Iowa, Missouri, Dakota, and the following at the falls of St. Anthony in Minnesota:

Strophomena, allied to *S. alternata.*
Strophomena, new species.
Orthis testudinaria? (Murch. Sil. Syst. pl. 20, fig. 10).
Orthis polygramma? (Murch. Sil. Syst. pl. 21, fig. 4[a]).
Orthis (three new species).
Steriocisma (resembling *Terebratula schlothrimi*, Dal.)
Atrypa (new species).
Pleurotomaria (new species—numerous).
Euomphalus, allied to *Maclurites magna* (Des.)
Euomphalus, resembling *E. sculptus* (Sowerby).
Phragmolites, same as in the Trenton limestone in N. Y.
Phragmolites, new species.
Bellerophon bilobatus.
Orthoceras (two species, undetermined).

Crinoidal remains of peculiar forms, one resembling *Lipocrinites.*
Turbinolopsis bina? (Sil. Syst. pl. 16 bis, fig. 5.)
Favosites lycoperdon (Say). Trenton limestone fossil.
Favosites (two new species).
Fucoides (obscure).
Cyathophyllum ceratites?
Turritella.

Of the list of plants determined by Dr. Torrey for Mr. Nicollet, the greater part were collected in Dakota or in Missouri, but fifty-six species being assigned to Minnesota.

CAPT. J. ALLEN'S EXPEDITION TO THE SOURCE OF THE DES MOINES IN 1844.

This expedition reached a lake which was found by observations of the sun with a small sextant to be in lat. 43° 57′ 32″. This was probably what is now known as lake Shetek, which is somewhat above 44° of latitude.* This lake he named lake of the Oaks. He described it as remarkable for a singular arrangement of the peninsulas running into it from all sides, and for a heavy growth of timber that covers these peninsulas and the borders of the lake. He explored the country north from this lake thirty-seven miles, and thence eastward to the St. Peter's river. Returning to lake Shetek he traveled westward to the Big Sioux river which he followed to its mouth.

ELK AND BUFFALO ON THE DES MOINES IN 1845.

"From Lizard creek of the Des Moines to the source of the Des Moines, and thence east to the St. Peter's, is a range for elk and common deer, but principally elk. We saw a great many of the elk on our route and killed many of them; they were sometimes seen in droves of hundreds, but were always difficult to approach, and very difficult to overtake in chase, except with a fleet horse and over good ground. No dependence could be placed upon this game in this country for the subsistence of troops marching through it.

"Twenty-five miles west of the source of the Des Moines we struck the range of the buffalo and continued in it to the Big Sioux river, and down

* Ex. Docs., First Session, 29th Congress, 1845-'6, Vol. VI. No. 168.

that river about eighty-six miles. Below that we could not see any recent signs of them. We found antelope in the same range with the buffalo, but no elk, and very seldom a common deer. While among the buffalo we killed as many as we wanted, and without trouble."

THE UPPER DES MOINES RIVER.

Upon approaching the region of the boundary line between Iowa and Minnesota he became penned among numerous lakes, and was compelled to cross a narrow strait by swimming 200 yards. This was probably across a narrow spot in Swan lake, in Emmett county, Iowa. From there he sent a party to examine the country toward the east. This party reached Iowa lake (on the boundary line) and explored its outlet toward the east and into the East Chain of lakes, reaching the conclusion that the water was tributary to the Blue Earth, "or of an unknown tributary of the Big Cedar." He passed by Eagle lake, and Independence lake, camping at each, and arrived in the vicinity of Windom where he describes the country as a "wonderfully broken surface, rising and falling in high knobs and deep ravines, with numerous little lakes in the deep valleys, some of them clear and pretty and others grassy." A party which visited the Blue mounds, near Windom, found an artificial mound of stone on the highest peak. He visited Talcott lake, where he rested his men in camp, and himself visited lake Shetek, which he pronounced the highest source of the Des Moines worth noticing as such, though he also mentions an inlet from the northward, "but of no size or character." He crossed the Cottonwood nearly north from lake Shetek, also the Redwood river still further north, and the latter again near Redwood falls. From the mouth of the Redwood he explored the south shore of the Minnesota several miles up and down, and returned to lake Shetek. He crossed the *Coteau des Prairies* in Cottonwood county, styling it the "Big Prairie." He reached the Big Sioux river without finding any such stream as that which had been shown on the maps as "Floyd's river."

CAPT. E. V. SUMNER'S EXPEDITION IN 1845.

The expedition of Capt. E. V. Sumner* seems to have been made more

*Executive Documents, 1st Sess., 29th Congress, 1845–46. No. 2, p. 217.

1850, Owen.

for the purpose of impressing the Indians with the power of the government and the necessity of committing no depredations on the settlers, than for the purpose of learning the nature of the country. He left Fort Atkinson, June 3d, and arrived at "Traverse des Sioux" June 22d, having met Lieut. Allen June 13th, about midway between Fort Atkinson and the St. Peter's river. The companies continued together from that time. From Traverse des Sioux they marched to Lac qui Parle, where Capt. Sumner had an important conference with the *Warpeton Sioux*, whom he distinguishes as the "upper Sioux." He reached Big Stone lake on the 5th of July, where he met in council a large band of *Sissitons*. He reached "Devil's lake" on the forty-eighth degree of north latitude, on July 18th, where he had a conference with a party of the Winnipeg half-breeds, numbering about one hundred and eighty. He reached Traverse des Sioux on his return, the 7th of August; whence he repaired to Fort Atkinson on the 11th, Capt. Allen returning to Fort Des Moines.

THE SURVEY OF D. D. OWEN, 1847–1850.

The fine quarto volume which resulted from Dr. Owen's survey of Wisconsin, Iowa and Minnesota, was a report made in pursuance of instructions from the Treasury Department, Washington, addressed to Hon. J. Butterfield, Commissioner of the General Land Office, and was published by Lipcott, Grambo & Co., Philadelphia, in 1852. While it was not the first of the scientific reports published by the U. S. government relating to the geology of the territories, it was the first of note conducted and published by other than the Department ot War. It has proved to be the worthy sire of a numerous progeny, the initiation and exemplar of a series of scientific publications by the U. S. government, partly under the War Department and partly by the Department of the Interior, which have caused American science to illumine the whole world. The work of Owen was continued by Foster and Whitney, and revived and extended by Hayden. Dr. Owen's field extended from St. Louis to the British line, and from the west shore ot lake Michigan to the Missouri river. Its primary object was to derive information for the removal of such lands as were valuable for their mineral resources from sale, in the land office at Washington. Such an inquiry

necessarily embraced many geological and chemical questions, and required at least a preliminary geological survey. The earlier reconnoissances of Majors Long and Pike, and Mr. Schoolcraft, embraced many isolated important facts bearing on the geology and natural history of Minnesota, made incidentally along the routes they took, but Dr. Owen's survey was more comprehensive and more detailed. Its primary object being an examination of the country and not a military reconnoissance, it did not contend with the difficulties incident to rapid marching, complained of by Keating and Beltrami. His report throws the first real light, derived from the systematized science of modern times, on the geology and the present fauna and flora of Minnesota. The work was sufficiently prolonged to enable the naturalists who co-operated with him to gather reliable facts enough to lay down correctly the ground-work of a vast extent of scientific research. His report not only corrected prevalent errors, but established on correct paleontological evidence the age of most of the bedded rocks of Minnesota, and disseminated information concerning its topography and soil.*

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*Dr. Owen's corps consisted of the following gentlemen: J. G. NORWOOD, Assistant Geologist; J. EVANS, B. F. SHUMARD, B. C, MACY, C. WHITTLESEY, A. LITTON, R. OWEN, heads of sub-corps; G. WARREN, H. PRATTEN, F. B. MEEK, J. BEAL, sub-assistants.

Dr. Owen's own report, covering the first 206 pages of the volume, is divided into six chapters. He gives a brief history of the explorations of the various corps, sketches the difficulties and adventures that befell them, and names the salient points of interest in the progress, and the results of the survey, in the Introduction. The chapters are as follows:

1. Formations of the upper Mississippi and its tributaries, belonging to the Silurian Period.
2. Formations of the Cedar, and part of the lower Iowa river, belonging to the Devonian Period.
3. Carboniferous rocks of southern and western Iowa.
4. Formations of the interior of Wisconsin and Minnesota.
5. Formations of lake Superior.
6. Incidental observations on the Missouri river, and on the Mauvaises Terres (Bad Lands).

Dr. Norwood's report on some portions of the country adjacent to lake Superior consists of—

1. Boundaries and topographical notices.
2. Descriptive catalogue of the rocks referred to in his report.
3. Narrative of the explorations made in 1847, between La Pointe and St. Louis river, and between Fond du Lac and the falls of St. Anthony, and on the St Croix river.
4. Physical structure and geology of the northwestern and western portions of the valley of lake Superior.

Col. Chas. Whittlesey's report pertains to that portion of Wisconsin bordering on the south shore of lake Superior, with the following chapters:

1. General description and geology ot the Bad river country, and of that between the Bad river and the Brule; with descriptions and detailed sections of rocks like those which in Michigan are copper-bearing; and accounts of the magnetic-iron beds of the Penokie Iron range, and of "Iron Ridge", in Dodge county, Wisconsin.
2. Description of the country between the Wisconsin and Menomonie rivers; with a discussion of the general geology, and its relations to other parts of the Northwest.
3. Red clay and drift of Green bay and Wisconsin.
4. Barometrical and thermometrical observations.
5. Lumbering on the waters of Green bay.

Dr. B. F Shumard's report pertains to local and detailed observations in the valleys of the Minnesota, Mississippi and Wisconsin rivers, as follows:

1. Detailed observations of the St. Peter's and its tributaries
2. Local sections on the upper Mississippi.
3. Local sections on the Wisconsin and Baraboo rivers.
4. Observations on Snake, Kettle, and Rush rivers.

Dr. J. Leidy furnished for the volume a memoir on the remains of extinct *Mammalia* and *Chelonia*, from Nebraska territory.

The Appendix embraces—

1. Descriptions of new and imperfectly known genera and species of organic remains collected during the geological surveys ot Wisconsin, Iowa and Minnesota. By D. D. Owen.
2. Descriptions of one new genus and twenty-two new species of *Crinoidea* from the Subcarboniferous limestone of Iowa. By D. D. Owen and B. F. Shumard.
3. Summary of the distribution of orders, genera and species in the Northwest. By D. D. Owen and B. F. Shumard.
4. Additional chemical examinations. By D. D. Owen.
5. Systematic catalogue of plants of Wisconsin and Minnesota. By C. C. Parry.
6. Table of stratigraphical and geological distribution of genera and species in the Northwest.

The volume is illustrated with twenty-six plates of fossils, twenty maps and large plates of geological sections, and a general geological map of the whole country reported on; the whole constituting at that time one of the largest and most expensive scientific publications of the United States government, and a monument at once to the learning, the zeal and wise management of Dr. Owen.

The survey of Owen, so far as it threw light on the state of Minnesota, served for a reconnoissance, and indicated within certain broad limits the general topography and geology. It first established the Lower Silurian age of the rocks outcropping along the upper Mississippi valley, and especially of that forming the brink of the falls of St. Anthony which had generally been regarded as Carboniferous. Under the general term "protozoic rocks," he describes the "lower sandstone of the upper Mississippi," which he says may be seen in the lower portions of the bluffs of the river, and in the sandstones of the Minnesota valley above Shakopee. In the upper portions of this great formation he brought to light an interesting and very important series of organic remains, and in its lower portions he found beds charged with *Lingulæ* and *Orbiculæ*. He enumerates six horizons that hold trilobites, the uppermost separated from the lowest by an interval of about 500 feet, though it is highly probable that some of these trilobite beds are contemporary, and that the actual thickness of this formation is somewhat less than 500 feet, as developed on the upper Mississippi. Nowhere in his report does Dr. Owen parallelize these beds with the Potsdam sandstone of New York, but seems to believe that the "palæozoic base" of the Mississippi as seen on the St. Croix river, is from seventy-five to one hundred feet lower than the parallel of the "Lingula beds" of the New York Potsdam, which, up to that time, had been regarded as the lowest fossiliferous base in the United States (page 50). But in the appendix (p. 634) are tables of the equivalency of the geological formations, and of the stratigraphical distribution of genera of fossils, in which, presumably constructed by Dr. Owen, this formation is parallelized with the Potsdam of New York state.* Under the term "protozoic rocks" he not only includes the lowest sandstones but also the rest of the Lower and Upper Silurian. He separates the limestones of the Northwest into Lower and Upper Magnesian, the former being that which still retains that name, though by him and his corps always confounded with the Shakopee limestone of Minnesota, in the same manner as he confounds the outcrops of the Jordan sandstone with the "lowest sandstone". In the latter he has included the Galena of the Lower Silurian and the Niagara of the Upper Silurian, having failed to

*See also *Proc. Acad. Nat. Sci. Phil.* 1852. p. 190.

observe any thing that represented the Maquoketa shales, which separate them in Iowa. The Galena he makes the equivalent of the Utica slate and Hudson River group, which latter also seems to include the Maquoketa shales. He recognized the Devonian formation near the southern boundary of the state along the Cedar river, but he made no note of the Cretaceous within the state. Its exposures are referred by his assistant, Dr. B. F. Shumard, either to the Lower Silurian or to the epoch of the drift. Fragments of lignite found in the valley of the "Mankato" river were supposed by him not to have come from the rock *in situ* within Minnesota, but to have been transported with the drift from the north, perhaps from the beds reported by Dr. Richardson to contain coal on the shore of Great Bear lake, "or from the Cretaceous or super-Cretaceous lignite formations which were observed by Nicollet and others, off toward the Missouri and Rocky mountains."

That part of the report which is most valuable to Minnesota was written by Dr. J. G. Norwood. It is also the most voluminous.* The rock specimens collected by him, numbered up to 680, are described with care and discrimination, and were probably deposited in the Smithsonian Institution at Washington. They were obtained in the northern and eastern portions of the state, and illustrate specially the northwest shore of lake Superior. The report on the north shore of lake Superior is remarkable for the minuteness of the description of the topography of numerous valleys, and for the correctness of the general views of its geology. Its numerous illustrations are graphic, and, although sometimes aided by idealization, are essentially correct. They show vividly the interstratification of the igneous and sedimentary rocks, and depict numerous remarkably picturesque spots at which both the artist and the geologist willingly linger. His views of the metamorphism of the sedimentary beds by the action of the igneous, were in accord with the current interpretation of crystalline rocks of his day, and were in confirmation of the views of Mr. Mather of the New York state survey, in opposition to those of Mr. Emmons, on the Taconic controversy, although the bearing of his report on that controversy was not mentioned by Dr. Norwood. The frequency and importance of the action of the igne-

*This valuable report is not mentioned by Dr. T. S. Hunt in his resume of the literature of the crystalline rocks of America for the second Pennsylvania Survey (Rep. E.)

†In the ninth annual report of the Smithsonian Institution, where the collections of Dr. Owen are catalogued, together with those of Jackson, Locke, Foster and Whitney, no mention is made of those of Norwood.

ous rocks on the sedimentary is prominently brought out in the report. This complicates the geology and renders the identification of the rocks both difficult and sometimes erroneous. In conclusion he remarks "that there is perhaps no extinct volcanic region in the world where trap and other igneous intrusions can be studied to better advantage than in the country bordering on the northwest shore of lake Superior. Not only are the vertical dykes numerous and conspicuous, but there are abundant examples of overflows, as well as interlaminated insinuations producing all degrees of metamorphosis on the adjacent strata, graduating from mere induration of the beds to complete obliteration of stratification and sedimentary origin, so that the beds of deposition become confounded with the igneous masses that have invaded them and produced such extraordinary changes."

Dr. B. F. Shumard made the only examination of the valley of the Minnesota; which he ascended as far as the mouth of the Redwood river. At that point he was attacked with pleurisy, and was compelled to return hastily to Traverse des Sioux and Fort Snelling. His report exhibits the first attempt ever made to parallelize the rocks of the valley with those of the rest of the state, or to determine their age by reference to a known standard of nomenclature. He recognized Dr. Owen's Nos. 2C and 3A, at the mouth of the river in the Fort Snelling bluff, i. e. the Trenton and Black River limestones, and the St. Peter sandstone. At Shakopee, and thence to Little rapids (near Carver) he notes the Lower Magnesian. The sandstone at the last place he regards as belonging to a formation several hundred feet below the white sandstone of the Fort Snelling bluff,* and probably to the sandstones of Formation 1. The limestone and sandstone exposed at intervals from Shakopee to Mankato, forming the immediate bluffs of the river, and constituting several islands, he refers to the Lower Magnesian and the sandstones of Formation 1. Ascending the Blue Earth river six or eight miles, and observing the same geological horizon as far as he went, he notes subsequently two or three exposures of Formation 1, before reaching the mouth of the Waraju (Cottonwood) river, one being two miles below the mouth of that stream. The red quartzyte opposite the mouth of the Waraju he regards as the lower beds

*It is the *Jordan Sandstone*, and lies about seventy-five feet below the sandstone of the Fort Snelling bluff, the Shakopee limestone separating them.

of Formation 1, more or less altered by metamorphism "where they abut upon the igneous rocks." He also notes conglomerate and granite outcrops about a mile in a straight line above the mouth of the Waraju. He mentions granite at La Petite Roche, and at frequent other points before reaching the Redwood river. He describes an interesting exposure two or three miles below the mouth of this river, probably the same as that described by Keating and by Beltrami.

Mr. Shumard also gives the details of local sections on the upper Mississippi in Minnesota and Wisconsin, beginning with the falls of St. Anthony, and on the Wisconsin and Baraboo rivers, as well as observations on the sandstones, conglomerates and trap-rocks of Snake and Kettle rivers. On the Snake and Kettle rivers he made collections of a peculiar green mineral from the amygdaloids, which at first was soft as tallow but on exposure became brittle. It was analyzed by Dr. Owen and regarded as new,* but resembling phillipsite from Iceland, being really a "magnesian harmotome."

MAJOR WOODS' EXPEDITION TO PEMBINA.

In the summer of 1849, Major S. Woods was despatched by the Secretary of War to the Pembina settlement for the purpose of selecting a site for a military post. His report† is not accompanied by any map, although Capt. John Pope states he prepared a map of the route. He proceeded from Fort Snelling to Sauk Rapids, along the east side of the Mississippi, a route well known and traveled at that time every summer by large "trains" of carts from the Red River settlements. Passing up the Sauk valley, on the north side of the river, the expedition crossed it at the great bend, and reached lake David, which is described as having a length north and south and draining into a branch of Crow river, twelve miles west of the great bend of the Sauk river. Seven or eight miles from lake David is lake Henrie, of about the same size. Lightning lake, is about seven miles from the point at which the trail crossed the branch of Crow river, so named from the incident of a terriffic thunder-storm in which Lieut. Nelson's life was nearly lost by lightning striking his tent-pole. Fourteen miles further

*Jour. Phil. Acad. Science, (2), II. 183.
†House Ex. Doc. No. 51, 1st Sess. 31st Cong.

was White Bear lake, with an average width of two miles, and a length of perhaps eight or ten miles east and west, seventy-five miles from Sauk Rapids. "The heavily timbered highlands that range parallel with the Mississippi and back some distance from it, edge upon this lake. * * * On the north of the lake the prairie is broken and irregular, but the east, west and south borders lie handsomely for cultivation." The lakes are all described as having abundance of excellent fish. Fourteen miles from White Bear lake he reached Pike lake, and twelve miles further crossed the main branch of the Chippewa river. After passing Elk and Elbow lakes he came to Rabbit river, then Otter-tail Lake river flowing south of west. At the ford of the latter stream he states the bottom of the river is "rocky", the banks are good, water two to three feet deep and some fifty yards wide. Twenty-two miles further he crossed the Red river again, ten or fifteen miles below the mouth of the Bois des Sioux river. The rest of his journey was in Dakota, and he returned by the same route. Respecting the country west of the Red river he says it is "a level, marshy region back about thirty miles to Pembina mountain, which rises into a high peak near the forty-ninth parallel and ranges off nearly south, forming the western border of the valley of the Red river, and connects with the highlands extending out from lake Traverse near the headwaters of the St. Peter's river."

CAPT. POPE'S REPORT OF THE PEMBINA EXPEDITION.

Capt. Pope's report of the same expedition was addressed to Col. J. J. Abert, of the corps of topographical engineers, and was dated February 5, 1850, transmitted from St. Louis, Missouri, and printed by order of the Senate, Ex. Doc. No. 42, 31st Congress, first session. Instead of returning to Fort Snelling by the route by which the expedition went out, Capt. Pope organized a party which ascended the Red river of the North from Pembina to Otter-tail lake in canoes, and thence reached the Mississippi by Leaf and Crow Wing rivers, for the purpose of further exploration of the country. He places the head of navigation at a point in the vicinity of the mouth of the Sioux Wood river, distant forty miles from the St. Peter's. The Pomme de Terre river he mentions under the name Tipsenah, or Potato river.

"The valley of the Red river is entirely alluvial in its formation, no

rocks in place being found in its entire length within the territories of the United States. It abounds with boulders or erratic blocks of granite, which in all cases are very much rounded by the action of water. They are most abundant upon the highest ridges of the prairies, and cause all the rapids in the small streams tributary to the Red river, the St. Peter's and Mississippi. About seventy miles north of our frontier (at Pembina) a secondary limestone appears at the falls of the Red river, which is unquestionably the basis of the whole valley, but at what depth below the surface at different points it is impossible to say. There are no rocks in place found west of the Mississippi along the route pursued by the expedition to the Red river of the North, and the geological features of the banks of the Mississippi have been given in the report of Mr. Nicollet, published in the year 1842."

Capt. Pope states that there were three routes by which to reach the valley of the Red river of the North, used by the traders and trappers in their annual pilgrimages to the Mississippi with their peltries. The most southern follows the valley of the St. Peter's, and descends into the plains of the Red river near lake Traverse. The middle route leaves the Mississippi at Sauk Rapids, seventy-six miles above the mouth of the St. Peter's, and intersects the Red river near its most southern point. This is the route pursued by the expedition. The northern route follows for some distance the valley of Crow Wing river, and turning the northern extremity of Otter Tail lake, descends into the valley of the Red river near the mouth of Buffalo river. These routes were mere trails, and followed as far as possible the open prairie.

The further geographical facts which his report contains can be summarized as follows: Between Pembina and the mouth of the Red Lake river he passed successively the Two rivers, Park river, "Rivière au Marais No. 1," from the east; Big Salt river and "Rivière au Marais No. 2," from the west; Turtle river, and "Rivière au Marais No. 3" from the east, and a small stream called "Coulée* de l'Anglais." The largest of these were the "Rivière au Marais No. 1," and the Park, Big Salt and Turtle rivers, which were about eighteen yards wide and six feet deep, the Red Lake river itself being about fifty yards wide near its mouth and fourteen feet deep, and with a

*Coulee is often angticized to *couley* or *coulie*. It signifies a deep ravine, and was in common use among the ch voyageurs.

more rapid current than the Red river of the North. Above the mouth of the Sioux Wood river the Red river takes the name of Otter-tail Lake river, and, with a constant depth of water of four feet, becomes much more tortuous in its course.

GEN. POPE'S DESCRIPTION OF THE PARK REGION.

As we approached the western and northwestern slope of the Leaf mountain at the point where the river debouches from it into the level plains to the north, the current becomes sensibly more rapid, and the water clearer, until at about fifteen miles east of the crossing of the land route we found it necessary to use the cordelle. The banks become also much higher, with a tract of level, swampy land three-fourths of a mile in width between them, the river running from side to side through the swamp in the most serpentine manner. Small islands begin to be numerous, and the steep banks are perforated, in a thousand places, with clear cold springs. The woods along the banks also become much larger and more dense, oak being the more common tree. At about thirty miles above the mouth of the Sioux Wood river the rapids commence, and are almost continuous to Otter-tail lake. There are two and a half and three feet of water over them, and in the intervening pools of still water about three and a half feet. The bed of the river is filled with loose boulders of all sizes, and the deep water assumes an exceedingly crooked channel among them. Every hour of our advance toward the east increased the amount of heavy timber on the banks, and we began also to perceive, at various distances on each side, large groves of heavy timber upon the borders of numerous lakes, which I have described as forming so peculiar a feature of the country between the Mississippi and St. Peter's.

We had thus again entered the second general division of country I have made in a previous part of this report, and as we progressed toward the east the lakes became much more numerous, and the timber much heavier and more abundant. From Otter-tail lake to its entrance into Leaf mountain, the river passes through a number of beautiful lakes surrounded by rolling country, heavily timbered, with a depth of water from nine to twenty feet, and filled with the most luxuriant growth of wild rice. The largest and most beautiful of these is lake Gardiner, which is within eight miles of Otter-tail lake. On the 14th of September we reached the mouth of Little Pelican river, which, at its confluence with Otter-tail river, is about twenty yards wide, and about three feet deep.

On the morning of the 17th we arrived at Otter-tail lake, and encamped near its northeastern extremity, at the remains of several small trading houses. Upon entering this lake from the southwest, the woods to the northeast, although very large, are not visible, and it is by far the largest sheet of water we had yet seen. It is about ten miles in length from southwest to northeast, and four or five miles in width, filled with fish, with clear pure water, with a depth of twenty feet, and no islands. The fish are white, and said to be the same known as the white-fish of the lakes, so celebrated for their flavor.

To the west, northwest and northeast, the whole country is heavily timbered with oak, elm, ash, maple, birch, bass, &c., &c. Of these the sugar maple is probably the most valuable, and in the vicinity of Otter-tail lake large quantities of maple sugar are manufactured by the Indians. The wild rice, which exists in these lakes in the most lavish profusion, constitutes a most necessary article of food with the Indians, and is gathered in large quantities in the months of September and October. To the east the banks of the lake are fringed with heavy oak and elm timber to the width of one mile. The whole region of country for fifty miles in all directions around this lake, is among the most beautiful and fertile in the world.

The fine scenery of lakes and open groves of oak timber, of winding streams connecting them, and beautifully rolling country on all sides, renders this portion of Minnesota the garden spot of the Northwest. It is impossible in a report of this character to describe the feelings of admiration and astonishment with which we first beheld the charming country in the vicinity of this lake, and were I to give expression to my own feelings and opinions in reference to it, I fear they would be considered the ravings of a visionary or an enthusiast. * * * * *

On the 19th of September we made a portage of one mile toward the east, to a small round lake about one and a half mile in diameter. This lake is completely isolated, having no apparent outlet or inlet. From the dip of the land, and the evident marks of an artificial obstruction (said to be a beaver dam) I am quite satisfied that this lake at one time discharged its waters into Ottertail lake. The evidences of this kind of obstruction are numerous throughout this region of country, and, whatever may be the theory as to the original extent of the waters, it is quite certain that the largest of the lakes has been divided into several smaller ones by the occurrence of these artificial dams.

The small lake on which we again embarked in our canoe is about ten feet deep, the water very clear, and no doubt containing abundance of fish.

A second portage of about twenty yards, over a dam of the same character, brought us to another lake of about the same size; a third portage of about half a mile through dwarf oak, brought us at the western extremity of Leaf lake, the source of Leaf river, which is a tributary of the Crow Wing. We had thus, in two hours, passed with our boat and baggage from the waters of the Red river of the North, which flow into the Hudson's bay, to the waters pouring into the gulf of Mexico.

The tributaries of the Red river of the North, and those of the Mississippi overlap each other to such an extent that I suppose there are a thousand places where a portage even shorter would have enabled us to pass from the waters of one into those of the other.

CAPT. RENO'S ROAD FROM THE BIG SIOUX RIVER TO MENDOTA.

In 1853 Capt. J. L. Reno executed a survey for a military road from the mouth of the Big Sioux river to Mendota. The carefully prepared and very full map transmitted with his report, seems not to have been published. After crossing the Des Moines river and traveling ten miles further, he entered Minnesota. This was in the vicinity of lakes which he names Spirit, Okamanpidan, and Omanhu, being, as he supposed, in the Undine region of Nicollet. He crossed the Chaniushkah and Perch rivers, the former a branch of the Blue Earth and the latter of the Watonwan. The route chosen lay along the west side of the Blue Earth to its union with the Minnesota, thence to Mankato, and thence on the Shakopee stony terrace to Babcock's mill near Kasota. Here the road left the river and ascended to the table-land, nearly 300 feet above the Minnesota, and entered the "Big Woods," owing to the discontinuance of the "second bottom." Opposite Traverse des Sioux Capt. Reno encountered Capt. Dodd of Minnesota, who had anticipated the government and had recently constructed a road from St. Paul to Rockbend (a short distance above Traverse des Sioux), thus much aiding Capt. Reno in getting through the unexplored labyrinth of lakes and marshes which there characterize the Big Woods. Passing by way of Eagle lake, Lakeville and the western border of the Vermilion prairie to the Mendota and Cannon river road, he followed it for six miles into Mendota.

GOVERNMENT ROADS IN MINNESOTA.

According to the report of Capt. J. H. Simpson,* dated September 20th, 1855, the following territorial roads were in course of construction at that time by the general government, viz., from Point Douglas to the mouth of the St. Louis river; from Point Douglas to Fort Ripley; from Wabasha to Mendota; from Mendota to the mouth of the Big Sioux river; from the mouth of Swan river to Long Prairie; from Fort Ripley to Pembina, and from St. Anthony falls to Fort Ridgely.†

PACIFIC RAILROAD SURVEY.

The reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi river to the Pacific ocean, made in 1853, 1854 and 1855, contain a few articles relating to the natural features of Minnesota. Such are found in Vol. I., pp. 39–55, on the *Route near the 47th and 49th parallels of north latitude;* Vol. II., p. 45, on a *Railroad from Puget sound via Smith pass to the Mississippi river,* by Fred. W. Lander; Vol. XII., Parts I. and II., wholly devoted to the Northern Pacific route, containing a *Final Report and Narrative,* by Gov. J. J. Stevens; and reports on *Botany* and *Zoology,* by Drs. Cooper, Gray, Suckley, and others. The Botanical Report embraces pp. 7–76, and six plates; the Zoological Report has 1–399 pages, and seventy-six plates. These Natural History papers, however, refer almost exclusively to the western portion of the route.†

PERIOD OF STATE EXPLORATION AND SURVEY, 1858–1881.

The first legislature that met after the admission of the State into the Union, gave due consideration to the subject of a geological survey. Although burdened with the legislation incident to the organization of the various institutions of a new state, the evident importance of some scheme for ascertaining the natural resources of the state, as the first step toward

*Ex. Docs. 1855-6. First Sess. 34th Congress. Vol. I. Part II., p. 468.

†The report and map of Capt. Sully, of a reconnoissance from Fort Ridgely to Fort Pierre in 1856, have not been published. Capt. Sully determined the source of the Big Sioux river to be in lake Kampeska (Warren.)

their full development, was felt: and although no general survey was instituted, a law was passed ordering at once a reprint of portions of the geological report of Wisconsin,* by Prof. Daniels, for the years 1854 and 1858. This was printed in 1860, and contained Dr. D. F. Weinland's "sketch of the lead region," with notes on the evidences of iron ore, which closed with a statement of the "objects of a geological and natural history survey," embracing thirty-four pages, dated Cambridge, Mass., Oct. 27, 1857. It also embraced a paper read before the American Geographical and Statistical Society, in 1856, by Mr. A. S. Hewitt, on the "statistics and history of the production of iron."

JOSEPH A. WHEELOCK.

[First Annual Report of the Commissioner of Statistics, or the year ending January 1st, 1860.]

The second legislature enacted, in February, 1860, a law establishing a bureau of statistics, and creating a Commissioner of statistics. Mr. Wheelock was appointed; and such was his indefatigable industry and his knowledge of the state, that on July 1st of the same year he rendered a voluminous report "for the year ending January 1st, 1860." This was the first official presentatiou of her natural capabilities on the part of the new state of Minnesota; and it is not saying too much to assert that it has been one of the most powerful instruments in recommending the state to eastern capitalists and farmers, and in hastening, as well as directing, the almost unprecedented growth that she has maintained from that time. This document deals not with the discovery of new facts, or the description of new regions, or the establishment ot new principles, but it is a forcible presentation, in easy grouping, of those known natural features and resources of the state, in a harmonious and terse yet comprehensive review, which give the state a commanding pre-eminence in the Union in point of agriculture, and promise for it a corresponding position in respect of population, manufactures, wealth and general intelligence. The statistics proper, presented by the Commissioner, are preceded by an able essay on the geographical position, physical geography, agricultural capabilities and climatology of the state. Chapters are also added on the condition and progress of agriculture, commerce, railroads, manufactures and public lands.

*Minnesota was formely embraced in the territory of Wisconsin.

Mr. Wheelock's second report as Commissioner of statistics, rendered December 1st, 1861, is very similar in scope and character to that of 1860, with the added value of the U. S. census returns for 1860.

ANDERSON AND CLARK.

The second legislature also passed, March 10th, 1860, a concurrent resolution providing for "Commissioners" to report on the geology of the state, and to submit a plan for a thorough geological survey of the state. The commissioners appointed were Charles L. Anderson and Thomas Clark. These gentlemen submitted separate reports under the date of January 25th, 1861, making an octavo pamphlet of twenty-six pages. It embraces a chapter on the general geological features of Minnesota, and one on a plan for a geological survey, by Mr. Anderson; also one by Mr. Clark on some general climatic, topographical and geological features of the northeastern portion of the state. Governor Ramsey discouraged the inauguration of a geological survey at that time, knowing that the cost is not only always great, but always greater than was expected, and believing that the actual material advantages to a state from such surveys are commonly overrated.* He considered that the new state had a sufficient burden in the establishment and support of its charitable and educational institutions, but hoped that when the state had reached that point when she "could expend fifty or a hundred thousand dollars in this one department of science," such a survey would be undertaken. He also recommended the commencement of a collection of state minerals at the seat of government, as an index to the extent of its mineral wealth and resources, which would thus become a matter for investigation.

Mr. Anderson's report summarizes briefly some of the chapters of Dr. Owen's report on Wisconsin, Iowa and Minnesota, and closes with some very pertinent remarks regarding the plan, object and cost of a geological survey.

> The *objects* of a geological survey may be stated very briefly, as follows: It consists in placing before the people of the state, in the most available and intelligible form, all the information that can be obtained in regard to the rocks, minerals and soils. Also to this might be added information, especially of a practical character, in regard to the vegetables and animals peculiar to the state.

*Message communicating to the House of Representatives the reports of Anderson and Clark.

Whatever part of the survey is undertaken and reported on, should be of the most *substantial* kind. All that is possible for human knowledge to accomplish should be accomplished. There should be no slighting of the work—no necessity for tearing down and building up again.

There is a vast accumulation of *experience* before us. We have the history of surveys in other states. If we are wise we can profit by what has been in many instances their loss. We can see where they have made gross mistakes in the management of their affairs. It would be useless to enumerate their errors. One, however, that I would not be doing my duty to pass in silence, is that of allowing *party prejudices* to interfere in any manner with a survey of this kind. I might mention some of our neighboring states, that have had sad experience in this respect. But that would be personal and might give offence. I may be permitted to say, however, that rewarding a political leader with the office of state geologist, and a liberal yearly salary, when he is totally incompetent for the task, is a thing that *has been*, but I trust *will not* be *again*.

As to the cost of such a survey, the strictest economy, consistent with the attainment of the object sought, should be rigidly pursued. If such were the course adopted, after the first year the survey, instead of being an expense, would be remunerative, at least indirectly so. Attention would be called to our mineral resources, and the erection of manufactories,—it may be of iron, copper or lead.—would soon engage the attention of capitalists, and an inflow of population would be the result, more than enough to repay the state the small appropriation made each year for the survey. But let us look at the subject in a more general way.

When we reflect on the amount of money that goes out of our state each year for articles that, with a little encouragement, might just as well be manufactured at home, it is no wonder that we hear so continuously the cry of "hard times." With as good iron ore as the world can produce, the United States still imports three million dollars worth of that article; Minnesota receiving her share. Copper is sent from lake Superior to England, there to be manufactnred, and returned to us at a cost of more than two hundred per cent. With a deposit of coal in North America twenty times the area of all the known deposits of the eastern continent, and almost thirty-five times as large an area in the United States as Great Britain's coal area, yet the Atlantic cities import annually 285,869 tons; and all these things because our home resources are not opened up, and because there is not sufficient encouragement to our own enterprise. What might be said of the United States, or any one of the states, in this respect, might also be said of Minnesota.

So much in regard to "counting the cost." Instead of the survey, if properly conducted, running the state in debt, it will be a means most potent in relieving her of financial embarrassment, and causing a feeling of independence, in being able to exist by her own internal richness.

HANCHETT AND CLARK.

Nothing seems to have been done, after the publication of the report of Anderson and Clark, respecting a geological survey of the state, till the meeting of the sixth legislature (1864), when the subject was revived, and resulted in the passage of a resolution authorizing the Governor to appoint and direct a state geologist. Dr. Aug. H. Hanchett was appointed, and Thomas Clark was his assistant. The report of Dr. Hanchett, dated New York, November 13th, 1864, covers eight pages, and embraces little of value to the state. He seems to have visited the shore of lake Superior, and coasted as far as Pigeon river, but to little purpose.

Mr. Clark, who accompanied him, was much more industrious in gathering facts and making observations. His report is valuable; it contains seventy pages, with chapters on—

1865, Eames.]

The Physical Geography of the district embraced in that portion of the state bordering on lake Superior. A large share of the geological report of Dr. Owen is devoted to this district; the maps accompanying that report were constructed previous to the linear surveys; Mr. Clark locates many of the points of interest, giving their section, township and range, especially the entrance of rivers, and prominent points or bays of the coast.

Meteorology of the district, embracing the carefully reduced results of one full year's observations, and of several concurrent and parallel months.

A list of plants and trees of the district, observed mainly between St. Paul and lake Superior, on the meridian 16° west from Washington; the northern and southern limits of species being noted.

H. H. EAMES.

The following year, under direction of Governor Miller, Mr. H. H. Eames continued the prosecution of the geological survey of the state, and his first report, without date, was printed in 1866. Mr. Eames' labor was essentially "prospecting." All other objects but a vigorous hunt for "mineral," were ignored. His first report is a pamphlet of twenty-three pages, and throughout it bears evidence that the writer was convinced, *a priori*, that the state of Minnesota was one of the richest mineral countries in the world. He discovered gold and silver, but could not yet state the "angle" at which veins containing them occur, but had the "impression that it would be found to be about 85°." These "discoveries" led to a gold-mining fever, centering on Vermilion lake, in the northern part of the state, in which many hundreds of thousands of dollars were squandered in the next two years. Several companies began mining, hauling their machinery and supplies from Duluth at great expense. Unscrupulous "assayers," "prospectors" and "geologists" fostered the excitement. A town of mushroom growth sprang up near the south side of the lake. A would-be geologist and "spiritualist," who subsequently aspired to the position of "peat-commissioner" to the state of Minnesota, located the precious lodes at Vermilion lake by the necromancy of spiritualistic mediums. The fever spread. The state geologist himself was chief owner and operator of one of the mines. The whole thing very soon collapsed, and

in a few years thereafter but one white man, a government officer, could be found in the whole region. Respecting the lignites of southwestern Minnesota, Mr. Eames says that he has no hesitation in recording his conviction that large deposits of good coal will be found there, "the stratum having a course southeast of the Big Cottonwood river, thence northwest to the Redwood river, crossing the Minnesota river at or near that point, also west of the Cottonwood, and having a bearing west of north. The outcrop of the formation can only be seen at a few points, as it has many local upheavals, and corresponding depressions."

Mr. Eames mentioned the iron ore at Vermilion lake, in the vicinity of the stream known as Two rivers. He describes it as lying in two ridges, nearly parallel, one being of hæmatite with jasperoid, quartzose and serpentine rocks, and the other of magetite of very good quality, the latter being north of the former. The iron is said to be exposed at two or three points, between fifty and sixty feet in thickness, presenting quite a mural face.

Passing down the lake Superior shore as far as Temperance river, he has a few words concerning the metalliferous character of the rocks at numerous places.

Mr. Eames' second report purports to give "reconnoissance in detail, of the northern, middle and other counties in Minnesota," comprising fifty-eight octavo pages. After presenting a brief outline of the different formations or systems of rocks that form the crust of the earth, he adds remarks on the igneous, the coal-bearing and the sandstone and limestone rocks of the state; also on peat; on mineral and fissure veins; on agricultural chemistry; on a geological reconnoissance "in detail", of the counties of St. Louis, Lake, Itasca, Cass, Todd, Otter Tail, Douglas, Stearns, Morrison, Benton, Sherburne, Redwood, Cottonwood, Ramsey and Washington, together with results of assays and thermometrical and barometrical observations in the months of June, July and August. He describes Pokegama falls as formed by an exposure of Potsdam sandstone (quartzyte), or the lowest of the Lower Silurian rocks. It presents a mural exposure of twenty feet above the level of the stream, and one-eighth of a mile in length, having a course 15° south of west. A similar fall is described on Prairie river, six or seven

miles above its point of union with the Mississippi, where he notes an uplift of igneous and metamorphosed rocks, consisting of granite, coarse and fine, "quartzyte or Potsdam sandstone," and iron ore, the water falling from twelve to fifteen feet. This iron ore occurs also on the west side of the river. At several places above these falls the same rocks are noted in place, particularly at the second falls and in a ridge near the head of the lake about a sixth of a mile from the south shore. The iron ores here seen, he found to afford from fifty to sixty per cent. metallic iron. He reports the same kind of drift limestone fragments on the upper Mississippi, about Pokegama falls, and on the St. Louis river, as in Otter Tail county and the Red river valley.

Mr. Richard M. Eames, his assistant, makes further statements concerning the quartz veins at Vermilion lake and their ramifications through the talcose slates, concluding with the statement that he belives that the "hidden sources of wealth, lying buried in the strata, would justify the investment of capital."

Mr. Eames' survey soon fell into disrepute, and further appropriations were not made by the legislature.

JAMES HALL IN MINNESOTA.

In 1865 the state legislature appropriated two thousand dollars to Mr. N. C. D. Taylor for the exploration of the mineral lands in the valley of the St. Croix river, lying in the state of Minnesota. A report of this work was rendered to the governor January 27th, 1866. It consists of about one page octavo, and states that he had found indications of copper on what is known as the "Kettle river trap range," having expended a considerable sum in examinations sufficient to show it to be "very promising for a rich paying vein." He also mentions a copper vein crossing the St. Croix river below the mouth of Kettle river, and one on Snake river; also one at Taylor's Falls, on which he had sunk a shaft, about forty feet in depth, and a second one three or four hundred feet from the first about twenty-two feet in depth. The most of the rock of the St. Croix valley above Taylor's Falls, he found to consist of different kinds of trap rocks, with belts of conglomerate running through them from northeast to south-

west, the conglomerate being particularly abundant on the Kettle river range.

As corroborative of his own opinions, Mr. Taylor incorporates the views of Prof. James Hall who was, presumably, employed to make a reconnoissance of the region in 1865. Prof. Hall is reported as saying that the Taylor's Falls vein is a very distinct vein, quite equal, in what it shows, to many of the best paying veins of lake Superior; and of the Kettle river vein, that so far as can be seen of it, it is even more promising than the one at Taylor's Falls, or the most promising that has been found in the country. He regarded the whole St. Croix region as worthy of further exploration for this metal.*

In the same year Prof. Hall visited the southwestern part of the state, his object being to ascertain the age of the coal that was then being explored on the Waraju river. The next year an interesting paper was published by him "On the geology of some portions of Minnesota from St. Paul to the western part of the state." It is to be found in the Transactions of the Philosophical Society of Philadelphia. The following points are made in this paper:

1. The Lower Magnesian and the Potsdam are seen in the bluffs of the river to Mankato.

2. A small portion of the St. Peter sandstone was seen at St. Peter, still preserved above the Lower Magnesian.

3. The rock at Pipestone he regards as Huronian.

4. At Redwood falls, and at other places, he mentions the "steatitic or glauconitic" beds resulting from the decomposition of the granite under the Cretaceous.

5. The limestone and green marls at New Ulm he regards Cretaceous.

6. The red marls and sandstone underlying, he thinks "are not older than the Triassic."

7. He suggests the former probable continuity of the western and eastern Cretaceous areas with the southern prolongation of the same rocks up the Mississippi valley.

8. Suggests the parallelism of the red marls and ferruginous sandstones

*A hasty statement has been made by Prof. R. D Irving in the Transactions of the American Institute of Mining Engineers, Vol VIII, that this copper region had not been recognized by the Minnesota geologists, but was first brought to light by himself. Dr. Shumard describes the same rocks, and Chas. Whittlesey says they are the "dying out in that direction of the great Kewenaw range."

at Winkelmann's, near New Ulm, with the gypsiferous deposits in the valley of the Des Moines.

9. Regards the Coteau des Prairies as made by a broad synclinal in the quartzyte outcropping at Redstone, and illustrates it by a diagram.*

CHARLES WHITTLESEY IN NORTHERN MINNESOTA.

Mr. Whittlesey, who had been employed on the survey of Dr. Owen, made further examinations in the state for private parties in 1859 and 1864, and his geological notes, with illustrations, were printed at Cleveland, Ohio, in 1866, by order of the legislature of Minnesota. This little pamphlet contains much information concerning the northern part of the state, not to be found in any earlier publication. His ascent of the Big Fork river was made in company with Dr. Norwood, when engaged on the survey of Dr. Owen, in September, 1848, and his description of that stream has but little that is not found in the report of Norwood.

Mr. Whittlesey was the first to make observations on the drift-deposits under the guide of any adequate conception or theory of their origin. Dr. Owen's survey ignored this subject entirely, or incidentally grouped the phenomena under the head of "agricultural capabilities",† while Mr. Eames was too much engaged in a mineral hunt to give them any consideration, except as impediments to "prospecting." Whittlesey's grouping of "glacial etchings" proves the direction of the glacial movement in the northern part of the state to have been from the northeast, and he unhesitatingly ascribes all the phenomena in North America to the agency of glaciers, placing the southern limit of the movement in New Jersey, northern Pennsylvania, Ohio, Indiana, Illinois, Wisconsin and Iowa.‡ The correctness of this early prognostication has been strikingly verified by late explorations in several of the states named. He could see no reason to suppose that any changes of level of the country have taken place since the era of the drift.

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*It is singular that this theoretical explanation of the Coteau should have been incorporated on the late geological map of the United States, by Profs. Hitchcock and Blake, accompanying the ninth United States census report, rather than the positive statements of all other observers who have crossed it, to the effect that no rocky outcrops are to be found If the Huronian rocks underlie the Coteau, they would certainly appear at the surface at a great many places. Prof. Hind visited this ridge near the 49th parallel; so did Dr. Owen; Mr. Featherstonhaugh had described it; Keating had given us information concerning it; Nicollet's opinions were on record. These all testify that it is made up of drift. Probably the basis rock is Cretaceous, as that formation appears on both sides in the adjoining streams. The examinations of the survey have established the "erratic" nature of the whole range. Compare *Bulletins of the Minnesota Academy, Vol. I. p.* 100.

†Compare Owen's description of the "southern confines of the Coteau." Introduction, pp. xxxv. and xxxvi.

‡Compare *Fresh-water glacial drift of the Northwestern states.* Smithsonian *Contributions*, May, 1864.

The lake Superior trap rocks, carrying native copper, he assigned to the age of the Potsdam.* Those carrying the sulphurets of copper, he placed in a different, and older system, the Huronian, after the generalization of Bigsby and Logan. The quartzyte at Pokegama falls, he styled Potsdam.

With the exception of occasional misapprehensions of minerals, Mr. Whittlesey's brief notes, with the accompanying rough illustrations, constitute a valuable and correct geological epitome of the northern part of Minnesota, from Encampment river on the east to the Grande Fourche, or Big Fork river, on the west. It embraces also short chapters on the general geology, the phenomena of the drift period, general elevations in Minnesota, fluctuations in the level of the lakes, the climate, and the cost of mining copper.

GENERAL G. K. WARREN ON THE MINNESOTA VALLEY.

The United States government detailed General Warren in 1866, for the survey of the upper Mississippi, Minnesota and Wisconsin rivers with a view to the improvement of navigation and the construction of bridges which should afford the least possible obstruction to navigation. The work on the Minnesota was continued in 1867 and 1868. In the annual report of the Chief of Engineers for 1868, is found General Warren's first published general expression of his views concerning the physical features of the Minnesota valley, although they were in part presented in Sen. Ex. Doc. No. 58, 39th Congress, 2nd Session, dated January 21, 1867. His final report, *in extenso*, was not rendered till 1874, owing to the intervention of other duties, and is to be found in the appendix to the report of the Chief of Engineers for that year.† Part II of this report is an *essay concerning important physical features exhibited in the valley of the Minnesota river, and upon their signification.* This is illustrated by several maps, plates and diagrams, and accompanied by a detailed description of the valley by his assistant, Mr. C. E. Davis.

The main points brought out in this essay are; 1st, that the Minnesota valley was formerly the course of a great river; 2nd, that this river

*On page 7 Mr. Whittlesey makes the following remark concerning the rocks of the Mesabi: "In many cases the syenite and granite appear to be more recent than the metamorphic slates, having all the appearance of intrusive rocks."

†See also the *American Naturalist*, November 1868, for a summary of a paper read by Gen. Warren before the *American Association for the Advancement of Science.*

drained the valley of lake Winnipeg; 3rd, that lake Winnipeg formerly had a great extension southward, according to the opinion of Prof. Henry Youle Hind;* and 4th, that the most plausible hypothesis to account for the former drainage of the Winnipeg basin along the valley of the Mississippi, and for the change to the present outlet by Nelson river, is a subsidence of the northern part of the valley and an elevation of the southern part, extending through a vast period of time, and probably still going on. He refers to the hypothesis that as the glacial epoch tempered off gradually into the present epoch, there might have been a long time when the glaciers had sufficient extension southward to close the outlet to Hudson's bay, which on the further recession of the ice, would be opened and the lake drained off toward the north. This hypothesis he regards as "unsupported, and barren of any fruit." He thinks it does not explain any phenomena presented by other lake-basins and water-courses in North America, nor enable us to predict what probable results we should find in other regions, and thus intelligently direct further investigation. He then mentions topographic features reported at numerous points in the United States and in the British possessions in America which seem to confirm the former hypothesis; and closes with a map showing a restoration of the ancient basin of the Mississippi. In this the source is shown to be a stream joining lake Winnipeg from the northwest. Lake Winnipeg is enlarged to exceed the area of lake Superior, extending to Big Stone lake, having its outlet by way of the Minnesota into the Mississippi; while at the same time an arm of the gulf of Mexico brings salt water up the great valley as far as the parallel on which Chicago lies, and farther still up the Missouri valley, the Ohio itself being an eastward extension from this arm nearly to Pittsburg.

In the proper place this subject will be fully discussed. It is only necessary to say here that the investigations of the survey, while sustaining all Gen. Warren's observations respecting the extension of a lake formerly occupying the Winnipeg and Red river valley, and the large size of the ancient Minnesota, warrant the hypothesis which he rejects, rather than the one which he adopts.

*Narrative of the Canadian Red river exploring expedition of 1857, and of the Assiniboine and Saskatchewan exploring expedition of 1858. By Henry Youle Hind. Two volumes.

HURLBUT ON THE GEOLOGY OF SOUTHERN MINNESOTA.

In 1871 Mr. W. D. Hurlbut, of Rochester, Minnesota, contributed a series of papers to the *Minnesota Teacher* on the geology of southern Minnesota, which were subsequently issued together as a pamphlet. These papers supply a lack, which was a conspicuous and remarkable one, in the geological literature of the state—considering the general accuracy and fullness of Owen's report—since no geologist had before penetrated this part of Minnesota, and nobody had called attention to its marked topography or to its geology. Owen's parties passed around it. They ascended the Mississippi, the Minnesota and the Des Moines, but the valleys of the Root and the Zumbro were not examined. It is in these valleys, and particularly on the upper tributaries, that the upper parts of the Silurian and the Devonian are found exposed.

Taking the Mississippi river, and the measurements and descriptions of Dr. Owen, as initial points, Mr. Hurlbut follows up the streams coming from the west, across the strike of the formations, noting the changes as they occur in the strata, and stating their main characteristics and thicknesses. He thus makes out the Potsdam, the Lower Magnesian, St. Peter sandstone, Trenton limestone flags, Hudson River shales, argillaceous shales which he regards of the age of the Clinton, and the Devonian. He also outlines their geographical extent, and states some of their topographic features. His identifications, being the first recorded attempt to parallelize those strata with any recognized base of nomenclature in the state of Minnesota, and dependent for the greater part on lithological features, were subject to such changes as a study of the fossils might require. His Hudson River shales were restricted to the very base of the rocks of that formation, and designated "Hudson River oil shales," having a maximum thickness of fifteen feet. They are the "Green shales" of the early reports of progress of the survey, and probably belong to the Hudson River group. His shaly limestone (Clinton) is the upper part of the Hudson River, becoming in some places a very calcareous member almost without shales. His Devonian, in which the arenaceous parts were supposed to be Schoharie sandstone, is the buff magnesian limestone of the Galena. The elevated land, further southwest from the strike of the last, in Mower and Fillmore counties, he suggests may con-

tain higher formations, such as the Iowa Subcarboniferous formation, but in the absence of exposures of the rock nothing could be ascertained without artificial excavations.

The discussion of the "Tertiary phenomena" by Mr. Hurlbut embraces Prof. J. D. Whitney's view of the origin of the driftless area in Iowa, and the opinions of Gen. G. K. Warren concerning the former direction of drainage of the Minnesota and upper Mississippi "westward into the Cretaceous ocean," in which he groups in a new and interesting manner many topographic and hypsometric facts, going to show that the interior of the state is a basin whose greatest depression is along the valley of the Minnesota, from its source to the head of lake Pepin. "The supposed surface and shore line of this lake basin is very well indicated, in many places, at about one thousand feet elevation above the sea, by clay terraces and bluffs, containing trunks and branches of trees, lignite clay and other lacustrine formations."

KLOOS' GEOLOGICAL OBSERVATIONS IN MINNESOTA.

In the same journal, in 1871. Mr. J. H. Kloos of St. Paul, records sundry geological observations made in the northern part of the state. He sketches the country briefly along the line of the new railroad from lake Superior to the Mississippi river at St. Paul, noting most closely the region of the slates on the St. Louis river, which he assigns to the Huronian formation; the conglomerates and red sandstones he assigns to the Potsdam, the latter being unconformable on the former, with a dip six or seven degrees toward the south; and suggests that beds of iron ore underlie the slates of the St. Louis river, as they do the slates of the Marquette iron range in Michigan; the hæmatitic and magnetic iron ore at Vermilion lake being perhaps in that horizon, and thus the lowest member of the Huronian formation.

In respect to the rocks at Duluth he describes, in general terms, the "Duluth granite," as a coarse crystalline rock consisting principally of a grayish-white feldspar showing three distinct cleavage planes, two of them being nearly at right angles; one plane has a glassy lustre, and the other a brilliant pearly lustre, with striæ which he regards as an indication of labradorite. Another constituent he named diallage, or hypersthene; and another magnetic iron. The rock he pronounces hyperyte, provisionally. He mentions the first rocks forming the immediate shore at Duluth, styling

them feldspar-porphyry, with magnetite and epidote. and also calcite and laumontite, some of the rock being amygdaloidal. Between the hyperyte and the porphyryte he notes another unstratified homogeneous black rock, of igneous origin; but he essays not to trace the relations which these igneous rocks bear to each other, though he states that they seem to be interstratified with the Potsdam sandstone at points farther down the coast.

The "trap rock" at Taylor's Falls he styles porphyryte, places it in the Huronian, and dissents from Dr. Owen, who regards the sandstone overlying as older than the trap. Mr. Kloos, on the other hand, demonstrates, by various diagrams and by his observations, that the sandstone was deposited, and still remains undisturbed, in horizontal stratification, unconformably, over the crystalline rock, and must be of later date.*

In respect to the copper discoveries at Taylor's Falls, he says that there are a great many small feldspathic veins, and that in one of these, where Mr. Taylor had sunk a shaft to the depth of twenty feet, copper was disseminated through the substance of the vein-rock (principally feldspathic and decomposed) in exceedingly thin foliæ, mixed sometimes with a sulphuret of copper, or copper-glance. The Kettle river discoveries he regards more favorably. They are forty miles above Taylor's Falls, and warrant the expectation that in other places on the Kettle river copper-bearing veins will be found at some future time.†

Mr. Kloos was the first to announce the Cretaceous rocks at any point so far north in the state as the Sauk valley. In the *American Journal of Science and Arts*, 1872, he gives the particulars of such a discovery, authenticated by paleontological determinations of Mr. F. B. Meek.

A. WINCHELL EXAMINES THE SALT WELL AT BELLE PLAINE.

The legislature of 1870 passed a law entitled "An act to aid in the development of the salt springs at Belle Plaine," which donated six sections of the state salt lands to a company organized for that purpose, on certain conditions. These conditions, which required the sinking of a drilled well at

*In the third volume of the report of the geological survey of Wisconsin, Mr. Sweet seems to have come to the same opinion independently, at a later date than Mr. Kloos.

†Subsequently Mr. Kloos and Prof. Streng made a careful examination of the crystalline rocks collected in Minnesota. Mr. Kloos' geological observations were published in *Zeitschrift d. d. geol. Gesellschaft*, 1871, S. 428; and the mineralogical papers of Streng and Kloos are to be found in the *Neues Jahrbuch fur Min. Geol. u. Pal.* 1877. *Vide*, also, the translations of these in the tenth and eleventh annual reports of the Geological and Natural History survey of Minnesota.

Belle Plaine, where indications of brine were said to exist, to the depth of several hundred feet, were complied with by the company, and the six sections of land were conveyed to the company. The following year, on the passage of another law to further aid in the development of the same salt springs, the conveyance was conditioned on a favorable report, after a geological survey of the vicinity of Belle Plaine by a competent geologist. Prof. A. Winchell of Ann Arbor, Michigan, having been designated by governor Austin, made the necessary examination, and reported in June, 1871. His report was transmitted to the senate in January, 1872, and was ordered printed. It is an octavo pamphlet of sixteen pages.* After stating the general facts and principles which guided the geologist in coming to a conclusion, the report gives some local geological observations in which the section of the exposed sand-rock along Sand creek, at Jordan, is for the first time carefully made out. It is regarded as of the Potsdam age, and placed beneath the Lower Magnesian limestone of Owen. No distinction is made between the stratigraphical horizon of the limestone at Kasota and that at St. Lawrence, and the sand-rock at Jordan is supposed to lie beneath both; the strata at Kasota being supposed to dip down the river so as to bring them at St. Lawrence about sixty feet nearer the water than at Kasota. From all the facts considered, the conclusion was reached that the prospect of obtaining brine at Belle Plaine was not encouraging; that the horizon of the rocks penetrated is below all known saliferous formations, and that even if the shales of the Trenton group should prove to be saliferous, the product is likely to accumulate under a region far to the south.

Notwithstanding the unfavorable report of the geologist, which rendered the appropriation of 1871 inoperative, the legislature of 1872 appropriated six sections more of the salt spring lands to the same company for the same purpose. Not only has no brine in workable quantities ever been obtained from this well, but the analyses of the present survey have failed to establish the alleged briny character of the water of the spring at Belle Plaine on which the expenditure was at first undertaken.

The same legislature (1872) enacted the law which initiated the present survey.

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*Report of a geological survey of the vicinity of Belle Plaine, Scott county, Minnesota. By A. Winchell.

HISTORY OF THE PRESENT SURVEY.

The law under which this survey has been carried on was drafted by president W. W. Folwell, and was introduced in the legislature by senator J. S. Pillsbury, then a regent of the University. It passed both houses, and was approved by governor Horace Austin, March 1, 1872. It reads as follows:

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. It shall be the duty of the board of regents of the University of Minnesota to cause to be begun as soon as may be practicable, and to carry on a thorough geological and natural history survey of the state.

SEC. 2. The geological survey shall be carried on with a view to a complete account of the mineral kingdom, as represented in the state, including the number, order, dip, and magnitude of the several geological strata, their richness in ores, coals, clays, peats, salines, and mineral waters, marls, cements, building stones and other useful materials, the value of said substances for economical purposes, and their accessibility; also an accurate chemical analysis of the various rocks, soils, ores, clays, peats, marls and other mineral substances; of which complete and exact record shall be made.

SEC. 3. The natural history survey shall include, first, an examination of the vegetable productions of the state, embracing all trees, shrubs, herbs, and grasses, native or naturalized in the state; second, a complete and scientific account of the animal kingdom, as properly represented in the state, including all mammalia, fishes, reptiles, birds and insects.

SEC. 4. The said surveys and examinations shall be made in the manner and order following: First, the geological survey proper together with the necessary and implied mineralogical investigations; all of which shall be undertaken as soon as may be practicable, and be carried forward with such expedition as may be consistent with economy and thoroughness; second, the botanical examinations; third, the zoological investigations. Provided, however, that whenever the said board of regents may find it most economical to prosecute different portions of the surveys in conjunction, or that the public interest demands it, they may, in their discretion, depart from the above prescribed order. And in the employment of assistants in the said surveys, the board of regents shall at all times give the preference to the students and graduates of the University of Minnesota, provided the same be well qualified for the duties.

SEC. 5. The said board of regents shall also cause to be collected and tabulated such meteorological statistics as may be needed to account for the varieties of climate in the various parts of the state; also to cause to be ascertained [by] barometrical observations or other appropriate means, the relative elevations and depressions of the different parts of the state; and also, on or before the completion of the said surveys, to cause to be compiled from such actual surveys and measurements as may be necessary, an accurate map of the state; which map, when approved by the governor, shall be the official map of the state.

SEC. 6. It shall be the duty of said board of regents to cause proper specimens, skillfully prepared, secured and labeled, of all rocks, soils, ores, coals, fossils, cements, building stones, plants, woods, skins and skeletons of animals, birds, insects and fishes, and other mineral, vegetable and animal substances and organisms discovered or examined in the course of said surveys, to be preserved for public inspection free of cost, in the University of Minnesota, in rooms convenient of access and properly warmed, lighted, ventilated and furnished, and in charge of a proper scientific curator; and they shall also, whenever the same may be practicable, cause duplicates in reasonable numbers and quantities of the above named specimens, to be collected and preserved for the purpose of exchanges with other state universities and scientific institutions, of which latter the Smithsonian Institution at Washington shall have the preference.

SEC. 7. The said board of regents shall cause a geological map of the state to be made as soon as may be practicable, upon which, by colors and other appropriate means and devices, the various geological formations shall be represented.

1872-82, Present survey.]

SEC. 8. It shall be the duty of the said board of regents, through their president, to make, on or before the second Tuesday in December of each and every year, a report showing the progress of the said surveys, accompanied by such maps, drawings and specifications as may be necessary and proper to exemplify the same to the governor, who shall lay the same before the legislature; and the said board of regents, upon the completion of any separate portion of the said surveys, shall cause to be prepared a memoir or final report, which shall embody in a convenient manner all useful and important information accumulated in the course of the investigation of the particular department or portion; which report or memoir shall likewise be communicated through the governor to the legislature.

SEC. 9. To carry out the provisions of this act the sum of one thousand dollars per annum is hereby appropriated, to be drawn and expended by the [said] board of regents of the University of Minnesota.

SEC. 10. This act shall take effect and be in force from and after its approval.

The present writer was appointed to conduct this survey in July, 1872, but, having work to complete in the state of Ohio, did not begin service till September. The field-work the first year occupied about a month and was closed by the first heavy fall of snow, November 12th. The means placed at the disposal of the state geologist not warranting the employment of assistants he was only able to make a general reconnoissance of the southern and central portions of the state accessible by railroad, and on this as a basis he was enabled to give a nearly complete section of the strata from the trap and granitic rocks to the Galena limestone in the Lower Silurian, including also about forty feet of the latter. Various out-crops of the Cretaceous were described also in the first annual report.

On the basis of the field-work done in the fall of 1872, and of reports already published, the first annual report of the survey gives a general *sketch of the geology of Minnesota*, as then known, accompanied by a small colored geological map of the state, and also a chart of geological nomenclature intended to express the relation of Minnesota to the great geological series of the earth, and the probable equivalency ot some of the names the formations have received in the various states and in Europe.

In the account of the "Potsdam sandstone" of the northwest, as defined by the Iowa and Wisconsin geologists, and of the red quartzytes of the same region, the first step was taken toward the investigation of that stratigraphical problem which seeks to determine the western equivalent of the Potsdam sandstone of New York; and inasmuch as the same name had by good authorities been applied to two different and quite distinct western formations, the name *St. Croix* was suggested for the light-colored sandstone of the upper Mississippi and St. Croix valleys, it being more probable that the Potsdam of New York was represented in Minnesota by the red quartzytes and shales underlying.

The state geologist, under the head of "plans and recommendations," makes the following statement in the first report.

The law under which the present survey is being prosecuted appropriates the sum of one thousand dollars per annum. This is too small for various reasons, the chief of which are, (1) It will not pay for the services of a single employé on the survey capable of working under the law. Hence it well-nigh renders the law inoperative. (2) It does not command the respect and confidence of the citizens of the state and others, and serves as an excuse for refusing aid and co-operation. The survey should be independent of favors for which it now has to beg, sometimes to be scornfully refused. (3) In the survey of those portions of the state inaccessible by public roads, or by railroads, it will be necessary to employ laborers, and incur other expense, for which the sum of one thousand dollars is not sufficient. (4) In order to conduct the survey on one thousand dollars per annum, the state geologist must find some other employment a portion of the year.* (5) The magnitude of the interests involved demands that ample means be allowed for doing the work of the survey thoroughly and without embarrassment. These considerations ought to induce the legislature to increase the amount now appropriated to a sum sufficient at least to keep one man constantly employed, and to pay all expense of field-work and chemical examinations. In connection with the subject of increasing the means provided for a geological survey, it is suggested that the state lands known as *salt spring lands* may be so sold or appropriated under the management of the board of regents of the university, as to be available for that purpose. It would be in perfect consonance with the original design, in the reservation of these lands from sale, if they were placed in the custody of the board of regents, conditioned on their use in the prosecutation of the geological and natural history survey of the state, with a view to the early and economical development of the brines of the state.

This recommendation respecting the use of salt spring lands for the prosecution of the survey, was based on representations made to the writer by Mr. W. D. Hurlbut of Rochester, and Hon. H. B. Wilson, superintendent of public instruction, and on conversations with Hon. O. P. Whitcomb, state auditor, and subsequently with senator J. S. Pillsbury and president Folwell; but it was only through the indefatigable and persistent efforts of senator Pillsbury, that the following law was passed by the legislature of 1873.† It is verbatim as drafted by the present writer, and by its action the survey has been supplied with funds needed for its prosecution.

Be it enacted by the Legislature of the State of Minnesota:

SECTION 1. The state lands known as *state salt lands*, donated by the general government to aid in the development of the brines in the state of Minnesota, shall be transferred to the custody and control of the board of regents of the university of Minnesota. By said board of regents these lands smay be sold in such manner, or in such amounts, consistent with the laws of the state of Minnesota, as they may see fit; the proceeds thereof being held in trust by them, and only disbursed in accordance with the law ordering a geological and natural history survey of the state.

SEC. 2. It shall be the duty of the said board of regents, as soon as practicable, to cause a full and scientific investigation and report on the salt springs of the state, with a view to the early development of such brine deposits as may exist within the state.

SEC. 3. The board of regents of the university shall cause the immediate survey and investigation of the peat deposits of the state of Minnesota, accompanied by such tests and chemical examinations as may be necessary to show their economical value, and their usefulness for the purpose of common fuel; a full report thereon to be presented to the legislature as soon as practicable.

*He was employed as instructor in the University of Minnesota during six months of each year from 1872 to 1878.
†It was introduced by senator Edmund Rice.

1872-82, Present survey.]

SEC. 4. The sum of two thousand dollars is hereby appropriated annually (in lieu of one thousand dollars) for the purpose of the geological and natural history survey until such time as the proceeds of the sales of the salt lands shall equal that amount, when such annual appropriation shall cease.

SEC. 5. The sum of five hundred dollars is hereby appropriated for the purchase of apparatus and chemicals for the use of the geological and natural history survey, the same to be expended by the order of the board of regents of the university of Minnesota.

SEC. 6. It shall be the duty of the board of regents of the university of Minnesota to cause duplicate geological specimens to be collected, and to furnish to each of the three Normal schools suites of such specimens after the university collection has become complete.

SEC. 7. When the geological and natural history survey of the state shall have been completed, the final report on the same by the said board of regents shall give a full statement of the sales of the salt lands hereby given into the custody and control of the board of regents of the university of Minnesota, together with the amount of moneys received therefrom, and of the balance, if any, left in the hands of said board of regents.

SEC. 8. This act shall take effect and be in force from and after its passage.

Approved March 10, 1873.

In compliance with the above law the state geologist made an examination of the peats in the southern portion of the state and rendered a report on them in 1873. On examining the condition of the United States grant of land for salt springs, which the same law devotes to the prosecution of the survey, it was found that a large part of these lands had never been certified to the state, not through any fault of the governor* or other state officers, but through the tardiness of the officers of the general government. The original grant covered 46,080 acres. Of this sum only 18,771 acres were then available for the prosecution of the survey. The uncertified lands aggregated 19,872 acres. A memorial of the state legislature was presented to congress, asking the privilege to make re-selections, and through the efforts of governor J. S. Pillsbury and senator S. J. R. McMillan, such permission was granted, and the certified amount of the salt spring lands, designed for the prosecution of the survey, was more than doubled.

The survey has continued without interruption since its beginning in 1872. The principal events, and its results from year to year have been recorded in the annual reports, and it is not necessary to enter upon the internal and personal history involved in its management and prosecution.

MINNEAPOLIS, JANUARY, 1881.

[NOTE.—Since this historical sketch was written Mr. Neill has published some new facts concerning Mr. David Thompson, who is mentioned on page 25 as a geographer employed by the Northwest Fur Company,† derived from the records of the company in the Parliament library at Ottawa. From this it appears that Mr. Thompson crossed the state of Minnesota in 1798, from

*Gov. H. H. Sibley had all these lands located according to the terms of the grant. See Report concerning the salt spring lands due the state of Minnesota. By N. H. Winchell, 1874.

†Neill's History of Minnesota, 4th edition, 1882.

[Present survey, 1872-82.

the Red river of the North to lake Superior. He ascended the Red Lake river to the Clearwater river, which he followed to the mouth of a tributary from the north, known as Wild Rice river. From the last he made a portage of four miles and again reached Red Lake river. From Red lake he proceeded southward by the usual route to Turtle lake, the same as the Julian Source the Mississippi described by Mr. Beltrami in 1823, thence down the Mississippi to Sandy lake and by way of the Savannah rivers to the mouth of the St. Louis at Fond du Lac.

Mr. Neill has also called attention to the existence of other maps of the region south and west of lake Superior older than that of Franquelin of 1688, represented on plate-page No. 2. One of these is by the engineer Randin, another is by Joliet and Franquelin, and a third is by Joliet. These maps give the name *Buade* to the Mississippi river, and apply the term *Frontenacie* to the whole country north and west of the mouth of the Wisconsin river. Only the third, that of Joliet, of 1764, has been published.

On the historical plate (No. 1), Du Luth's fort (Kamanistigouia) is placed at the mouth of the St. Louis river on the authority of Perrot, who says (*Collections of the Minnesota Historical Society* for 1867, p. 26), *son poste estoit au fond du lac Supérieur*, though many other authorities concur in placing it at Three Rivers, at the head of Thunder bay.]

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